

---



---

# JOURNAL

## OF THE

# ARNOLD ARBORETUM

---

VOL. XXVIII

JULY 1947

NUMBER 3

### A MONOGRAPH OF THE GENUS *ACRANTHERA* ARN. EX MEISN. (RUBIACEAE)

C. E. B. BREMEKAMP

*With two text-figures*

#### INTRODUCTION

#### A. THE IDENTITY OF *PSILOBIUM* JACK, *ACRANTHERA* ARN. EX MEISN. AND *GONYANERA* KHS.

JACK DESCRIBED IN 1822 (Mal. Misc. 2: 84) a new genus *Psilobium* based on two species discovered by him during his travels in Benkulen. The specimens which served for the descriptions have been lost. As the descriptions are rather short and give no measurements, it appears almost impossible to identify these plants. At least, as long as we are not absolutely sure that in this region not more than two species belonging to this genus occur, there can be little hope.

The genus was characterized in this way:

*"Psilobium* (W. J.); *Pentandria Monogynia*; N. O. *Rubiaceae* Juss.

Calyx patens, 5-partitus. Corolla tubo brevi, limbo 5-partito. Stamina basi corollae inserta. Stigma clavatum, 10-alatum, exsertum. Fructus cylindricus, siliquaeformis, foliolis calycinis persistentibus coronatus, bilocularis, polyspermus. Semina duplici serie axi affixa.

Fruticosa, pedunculis axillaribus paucifloris, aestivatione valvata."

For the determination of its position the following points are of special importance: the many-seeded fruit, the valvate aestivation of the corolla-lobes, the insertion of the stamens at the base of the corolla-tube, the clavate "stigma" (in reality that part of the style is meant on which the pollen is temporarily deposited, and from which it is afterwards removed by visiting insects), and the presence in each of the ovary-cells of two parallel axial placentas. The many-seeded fruit and the valvate aestivation of the corolla-lobes, it is true, appear in a large number of genera, but the other characters are much more exclusive; in fact, there are but

two other genera in which the whole set has been observed. These genera are: *Acranthera* Arn. ex Meisn. and the very imperfectly known *Gonyanera* Khs., the first based on a Ceylonese plant, the latter, like *Psilobium*, on a Sumatran plant.

It may be that Arnott when he described his new genus *Acranthera*, was not aware of the existence of *Psilobium* Jack, but it is also possible that he overrated the importance of the differences between the species on which his own and Jack's generic diagnoses have been based. The latter concern the position of the inflorescences, the presence or absence of a disk, and the structure of the ovary and fruit. The inflorescence of the Ceylon plant is found between the upper leaves, its disk is large and bulbous, and its ovary and fruit are according to Arnott "pseudo-bilocular," i.e. provided with an incomplete septum. In the Sumatran plants, on the other hand, the inflorescences have been described as axillary. The presence of a disk is not mentioned in Jack's description, and we may therefore assume that this organ is either absent or inconspicuous, and the ovary and fruit apparently are completely bilocular. The difference in the structure of the ovary and fruit afterwards proved to be untrue, for the median rent observed by Arnott in the septum, was, as Stapf (in Trans. Linn. Soc. II. 4: 173. 1894) pointed out, due to rough handling. All the same, it does not appear that Arnott attached much value to this character, for the supposed incompleteness of the septum did not withhold him from considering *Acranthera* a near ally of *Mussaenda* L., in which the septum certainly can not be regarded as imperfect. The two other points of difference are, as I will show further on, real enough, and might be considered a sufficient base for generic distinction. The authors, however, who subsequently occupied themselves either with *Psilobium* or *Acranthera*, did not see them in this light, for they indiscriminately referred to each of these genera species with or without a disk and with the inflorescences at the end of the stem as well as with opposite inflorescences. The Sumatran species of *Acranthera* described by Merrill (in Papers Mich. Acad. Sci. 19: 194. 1934) e.g. are, exactly like the *Psilobium* species of Jack, provided with opposite inflorescences, whereas *Psilobium siamense* Kerr produces its inflorescence exactly like Arnott's *Acranthera* species, at the top of the stem, and is also, like the latter, provided with a large bulbous disk. The explanation of this anomaly lies therein that those who occupied themselves with *Psilobium*, were insufficiently acquainted with *Acranthera*, whereas those who described new species of the latter, gave no heed to the existence of *Psilobium*.

As long as no specimens were available which could be referred to *Psilobium*, the position of this genus remained uncertain. It is true that already in 1872 a plant occurring in Pegu and Tenasserim had been described by Kurz (in Jour. As. Soc. Bengal 41(2): 313) as *Psilobium capillare*, but as the aestivation of its corolla-lobes is contorted, its flowers dioecious, its style provided with two erect hairy arms, and its placentation peltate, this obviously was a mistake; the plant can not even be considered



a near ally. Two years later Kurz himself (in Jour. As. Soc. Bengal 46: 189. 1874) recognized it as conspecific with the unnamed plants on which Hooker f. had based his genus *Morindopsis*.

In 1925, i.e. more than a century after the publication of Jack's paper, for the first time a plant was referred to *Psilobium*, of which there is no doubt that it fits Jack's generic description. It is a specimen discovered by Ridley among the plants collected by Brooks in Benkulen. Ridley refers to it in the following terms (in Kew Bull. 1925: 84. 1925):

"*Psilobium nutans* Jack. Lubok Tandai, herb, in shade, common, flowers white green, 6681.

I take this to be the long-lost *Psilobium* of Jack, obtained at Bencoolen. It agrees in almost all points with the description, but the calyx-lobes are described by him as "very large" which though they are fair size, hardly agrees with this."

I have not been able to study this specimen, and the data given by Ridley certainly do not prove that it really belongs to *Psilobium*. The lacking evidence, however, has been supplied by Kerr in the description of his *Ps. siamense* (in Hooker's Ic. Pl. 34: t. 3332. 1937). This species namely is said to differ from the plant collected by Brooks in the larger size of the flowers, the narrower calyx-lobes, the included sexual organs and the terminal position of the inflorescence, and must be assumed, therefore, to resemble the latter in all other points mentioned in his description. As the fruits of *Ps. siamense* are described as many-seeded, the aestivation of its corolla-lobes as valvate, the stamens as inserted at the base of the corolla-tube, the style as clavate, and the placentas as paired and axial, the set of characters by which the taxonomic position of the genus is determined, must be present in Brook's specimen too.

Although it can, therefore, hardly be doubted that the plant collected by Brooks fits Jack's generic description, it can not be admitted that it is conspecific with *Ps. nutans*, the type-species of Jack's genus. According to Ridley's own remarks it does not fully agree with the description but merely "in almost all points," its calyx-lobes notably not being "very large" but of "fair size" only. Ridley's identification, therefore, can not be accepted. The specimen collected by Brooks probably represents a different, although doubtless nearly related, species.

The taxonomic position of *Ps. siamense* Kerr is clearly indicated by the lengthened internodes, the terminal inflorescence, the halfway united filaments and the large disk, for there is but one other species known so far in which these characters appear. This is *Acranthera tomentosa* R.Br. ex Hook.f., a plant occurring in Assam.

The preceding exposé shows that the genera *Psilobium* Jack and *Acranthera* Arn. ex Meisn. are undoubtedly identical, and as the first dates from 1822, and the latter from 1838, the name *Acranthera* should, according to the priority rule, be rejected in favour of *Psilobium*. This change, however, could hardly be welcomed. In the first place, as neither of the species described by Jack could be rediscovered, there is as yet no type

to which the name *Psilobium* can be attached, and now that the importance of immutable types for the stabilisation of our nomenclature is generally recognized, this will doubtless be felt as a serious drawback. In the second place the change would cause a considerable amount of renaming, for 24 species of *Acranthera* would have to be transferred to *Psilobium*. If, on the other hand, the name *Acranthera* is conserved, but one species, namely *Psilobium siamense* Kerr, has to change its name, for, as stated above, there is very little chance that, for a long time to come, the two species described by Jack will be identified. There is, therefore, in my opinion, sufficient reason for conserving the name *Acranthera*.

In a paper published in 1851 Korthals (in Ned. Kruidk. Arch. 2(2): 183) proposed a new genus *Gonyanera*, which is described as follows:

"Calycis tubus cum ovario connatus, elongatus, subpentagonus; limbus patens, quinquepartitus, partes ovatae acutae. Corollae tubus brevis, limbus 5-partitus, partes aestivatione valvata. Stamina 5, exserta, tubo corollae affixa; filamenta brevissima; antherae conniventes, lineares, acutae. Stigma elongato-clavatum; stylus teres, glaber. Ovarium elongatum, angulatum, biloculare. Ovula numerosa, in placentis cylindricis laminae ope dissepimento affixis. Fructus baccatus, bilocularis; semina numerosa, minuta, compressa.

Arbuscula, ramulis teretibus. Folia opposita, longe petiolata, elliptica. Stipulae vaginantes. Flores axillares, bracteati."

In a remark added to the description Korthals declares that his new genus accedes to *Psilobium* in the form of the fruit, but that it differs from the latter in the flower-characters. A comparison of the two generic descriptions, however, fails to bear this out; they agree, in fact, even in minor details. That no mention is made of the genus *Acranthera*, probably finds its explanation in the circumstance that the description of the latter was unknown to him; his paper, namely, although printed in 1851, was written at about the same time at which the latter was published.

Although the description of the flower contains nothing which could stand in the way of an identification of Korthals's genus with *Acranthera*, some doubt might be raised by the description of its habit. It is said to be a small tree provided with terete branches. This is rather inconvenient, for the species of *Acranthera* are all unbranched plants with obtusely quadrangular stems. It is possible, however, that Korthals possessed no field-notes with regard to the habit of the plant, and as several years will have passed between the date of collection (Korthals visited Sumatra, where the plant was collected, in the years 1833-1835) and the date of description, his memory may have deceived him. He may accordingly have mistaken the stem for a branch. It is, of course, not impossible that the latter may have been somewhat more rounded than is usual in this genus, but as his specimens are lost, this supposition can not be verified.

The generic name itself might also offer some difficulty. It would mean (cf. Backer, Verkl. Woordenb. Wet. Plantennamen, Gron. 240. 1937) "pro-



vided with geniculate anthers"; in *Acranthera*, however, the stamens are perfectly straight. To account for this difficulty, I think that the name is misspelt, and that it should be "*Gonianera*": in that case it might be translated as "provided with an angular androecium." As the connective in the Sumatran species of *Acranthera* is strongly keeled, that would be very appropriate.

An entirely different view of the taxonomic position of *Gonyanera* was brought forward by Miquel (in Ann. Mus. Bot. Lugd.-Bat. 4: 262. 1869). He suggested that it might be identical with his own genus *Gardeniopsis* (l.c. 250), but this obviously is a wild shot, for *Gardeniopsis* with its axillary flowers, imbricate aestivation of the corolla-lobes and uni-ovular ovary-cells, clearly belongs to an entirely different circle of affinity. Its position is uncertain; it is even by no means sure that it is a Rubiaceae. Miquel says that Blume regarded it as a Rhizophoraceae, an opinion which deserves more attention than it has received so far. As our specimens are not provided with flowers, I have not been able to solve this problem.

As the specimens on which the description of *Gonyanera* was based are lost, and as the type-species, *G. glauca* Khs., itself has not been described, there is little hope that the identity of this species will ever be recognized. In the exertion of the sexual organs it resembles the two species described by Jack and the plant collected by Brooks. In *Acranthera longipes* Merr., the only Sumatran species of which flowers were available to me, I found the sexual organs included.

#### B. HISTORY OF THE GENUS ACRANTHERA ARN. EX MEISN.

The description of *Acranthera* was sent in January 1838 by Arnott to Meisner, who used it in the compilation of his survey of the Rubiaceae. The latter appeared in the same year in his "Plantarum Vascularum Genera" (1: 162). From a note on the genus *Acranthera* on p. 115 of the second volume, whose successive parts were probably issued simultaneously with the corresponding parts of the first volume, on which they form a running commentary, I infer that the name of the species had already been published as a "nomen nudum" in Wight's "Catalogus." The note reads: "72. (16.) *Acranthera*. Arnott mss. in litt. d. 30 Jan. 1838. ad nos dat. — Sp. 1: *A. Ceylanica*, Arn. in Wight cat. n. 2472. — Genus *Mussaendae* proximum, sed characteribus pluribus et tota facie diversum, ex auct." The number 72 indicates the place assigned to *Acranthera* among the genera belonging to the Rubiaceae; (16.) that among those referred by Meisner to the tribe "Gardeniaceae." The spelling of the specific epithet with a *c* instead of a *z*, as subsequently became customary, deserves our attention, as it evidently has precedence. The remark on the affinity of the new genus with *Mussaenda* L. is noteworthy, because it shows that the idea of a very close relation between these two genera, which up to this moment has never been questioned, originated with Arnott himself. In the following year Arnott's description appeared in the "Annals of Natural

History" (3: 20), and was repeated by Endlicher in his "Genera Plantarum" (p. 1394).

Arnott's description is excellent. Apart from the fact that he mistook the papilliferous upper portion of the style on which the pollen is only temporarily deposited, for the stigma, an error which had also been committed by Jack, and which at that time was comprehensible enough, it contains but a single objectionable statement. This concerns the description of the ovary and fruit. Meisner (Pl. Vasc. Gen. 1: 162) says of the latter that it is "sicut germen pseudo-2-loc., septo medio interrupto utrinque placentam divaricato-2-lamellatam gerente," and the first is described in his own words (in Ann. Nat. Hist. 3: 20. 1839) as "pseudo-biloculare, dissepimentis duobus oppositis, vix ad medium attingentibus, placentam bilamellatam divaricatam ferentibus." Beddome (Ic. Pl. Ind. Or. 1: 5. 1874) and Hooker f. (in Benth. et Hook.f., Gen. Pl. 2: 64. 1873 et Fl. Brit. Ind. 3: 92. 1880) accepted this statement as essentially correct, and described the ovary accordingly as unilocular and the placentation as parietal, but Stapf (in Trans. Linn. Soc. Bot. II, 4: 172. 1894) pointed out that both ovary and fruit are perfectly bilocular. They may, however, easily be mistaken for unilocular, because the dissepiment is rather thin in the middle and, therefore, is easily torn when the razor, with which the sections are made, is not sufficiently sharp.

The Ceylonese plant on which the genus was founded, shows, as Arnott already had noticed, a rather remarkable resemblance, especially in habit but also in the aspect of the fruits, to some species belonging to the *Cyrtandreae* (Gesneriaceae). This applies also to most of the species which since then have been discovered. As a matter of fact, I myself found two of my new ones (*A. Ruttenii* Brem. and *A. megaphylla* Brem.) among the unnamed species of *Cyrtandra* preserved in the Utrecht and Leiden herbaria, and some of those described by Valetton too had provisionally been referred to that genus. The resemblance, nevertheless, is but superficial, and even without looking at the flowers, the two genera are always easily distinguishable, for the leaves of *Acranthera* are never, like those of *Cyrtandra*, dentate, and they are always surrounded by a thin margin covered with stiff hairs; stipules or their cicatrices are always present in *Acranthera* and in *Cyrtandra* as constantly absent; and the fruits of *Acranthera* are always crowned by the persistent calyx, whereas in those of *Cyrtandra* the calyx, of course, is found at the base.

Up to 1872 the genus remained monotypic, but in that year Kurz (in Jour. As. Soc. Bengal, 41(2): 312) referred to it a Tenasserim plant which had been described by Don (Gen. Syst. 3: 491. 1834) under the name *Mussaenda uniflora* Wall. As it differs from the typical representatives of the genus *Mussaenda* L. in its small size and in the absence of the enlarged calyx-lobes, Kurz transferred it to *Acranthera*, which he regarded, on the authority of Arnott, as a nearly related genus. This transfer was doubtless a change for the worse, for the Tenasserim plant has many more characters in common with *Mussaenda* than with *Acranthera*: its stipules,



exactly as in *Mussaenda*, are deeply bifid, the flowers show the same form of heterostyly combined with dioecism which is found in that genus, the inside of the corolla-tube is not entirely glabrous but in the upper half covered with the same kind of yellow hairs as that of *Mussaenda*, the stamens are not inserted at the base of the corolla-tube but in or somewhat above the middle, the style ends in two filiform stigmas, and the placentas are peltate. The absence of the enlarged calyx-lobes, of course, can not be adduced as an argument in favour of a near affinity with *Acranthera*, as the latter is certainly not the only genus in which none of the calyx-lobes is enlarged, and as its mode of vegetative propagation by means of stolons is never met with in *Acranthera*, there is no appreciable similarity in habit. Hooker f. (Fl. Brit. Ind. 3: 86. 1880) referred this species back to *Mussaenda*, but I could show (in *Blumea*, Suppl. 1: 118. 1937) that it is conspecific with the type-species of *Aphaenandra* Miq., a genus which deserves to be kept up.

Two years after Kurz's abortive attempt to widen the scope of the genus, the generic isolation of the type-species was definitely broken by the description of two new species by Beddome (Ic. Pl. Ind. Or. 1: 5. 1874). Both had been collected in the Western Ghats. At the same time of all three species figures were given (l.c. t. 23-25), but the details of the latter are, unfortunately, of rather doubtful value.

Hooker f. (Fl. Brit. Ind. 3: 92. 1880) brought the number of species to six, but of the three new ones, *A. tomentosa* R.Br. ex Hook.f. alone may be considered congeneric; the two others, *A. Griffithii* Hook.f. and *A. Maingayi* Hook.f., show the same kind of stipules, the same form of heterostyly combined with dioecism, the same covering with yellow hairs in the upper part of the corolla-tube, the same insertion of the stamens midway in the corolla-tube, the same kind of stigmas and the same form of placentation as the Tenasserim plant which Kurz had referred to this genus, but which Hooker himself had excluded: they belong, like the latter, to the circle of affinity of *Mussaenda*. From the typical representatives of that genus they differ in habit, in the complete absence of the enlarged calyx-lobes, and in the large size and brilliant orange or scarlet colour of the corolla. Stapf (l.c. 173) referred them to a subgenus *Asemanthia*, which Ridley (in Kew Bull. 1939: 600. 1939) rightly raised to generic rank. *Acranthera tomentosa* R.Br. ex Hook.f. (*Androtropis tomentosa* R.Br. in Wall., Cat. n. 8398, nomen), on the other hand, is a true representative of the genus, although apparently no near ally of the species found in Ceylon and in the Indian Peninsula, from which it differs conspicuously in the greater length of the internodes, the larger size of the flowers and the halfway united filaments. The flower-colour and details of the structure of the fruit and seeds are still wanting. A near ally was recently discovered in Peninsular Siam: it is the plant described by Kerr under the name *Psilobium siamense* (see above).

The attitude taken up by Baillon (Hist. Pl. 7: 319, 449. 1880) was logically more consistent than that of Hooker, for recognizing that the



genus *Acranthera* in the latter's delimitation contained species which showed a nearer affinity to *Mussaenda* than to those for which the genus originally was created. He transferred the whole group to *Mussaenda*. The other way out of the difficulty, the purging of the genus of the extraneous elements, however, would have deserved preference. As I will show further on, the true representatives of the genus are by no means nearly related to *Mussaenda*.

Hooker l.c. had already mentioned the presence of species of *Acranthera* in Borneo, but as the genus in his delimitation included *Asemanthia* Ridl., and as both genera have since been found in Borneo, it is impossible to say whether the species he had in mind really belonged to *Acranthera*.

Stapf l.c. was the first to describe a Bornean species, and he too mentions the presence of undescribed Bornean species in the collection of the Kew Herbarium. After pointing out that the ovary of *Acranthera* is always bilocular, he proceeds: "Nevertheless, I think, *Acranthera* must be retained as a well-marked genus after excluding *A. Maingayi* and *A. Griffithii*. It may be characterized by the herbaceous growth, the generally elongated ovary and fruit, the blue or reddish, upwards widened and funnel-shaped or campanulate corolla and the club-shaped, entire style. It is known from Ceylon, the Tinnevely and Anamally Hills, the Khasia Hills, Cachar and Manipur, and there are several species, still undescribed, in the Kew Herbarium, from Borneo." Although the really important characters, the absence of hairs on the inside of the corolla, the insertion of the stamens at the latter's base, the way in which the anthers enclose the style and in which they are connected with it by means of the tips of their connectives, the way in which the upper part of the style functions as a temporary depository for the pollen, the subulate or semi-conical, often totally cohering stigmata, and the peculiar structure of the testa with its minutely punctate cells, have all been overlooked. The characters as they are given are not all of them general, for the corolla is by no means always blue or reddish, and the style not always club-shaped, the existence of a difference between *Acranthera* and *Mussaenda* is, nevertheless, clearly indicated. Which species Stapf meant when he said that the corolla might be reddish, is difficult to say. It is possible that the colour was described in this way on the label of one or more of the unnamed Bornean species, for instance on that of the plant afterwards described by Valetton under the name *A. involucrata*. At any rate, the flowers of the Ceylon and Peninsular species are blue, and those of *A. tomentosa* will probably, like those of the related *A. siamensis* (Kerr) Brem. n. comb. (*Psilobium siamense* Kerr), prove to be white or nearly white. The corolla of Stapf's own *A. atropella*, a species collected on the slopes of Mt. Kinabalu, has been described as "obscure cyanea." However, as the flowers of the Bornean species, which since then have come to light, are all either white, yellow, orange or red, I suppose that with regard to the flower-colour of *A. atropella* some error has been committed; maybe they assume a dark hue in drying.



In 1910 and 1912 Valetton (in Bot. Jahrb. 44: 550. 1910 et op. cit. 48: 111. 1912) described three more species from Borneo, of which one, *A. axilliflora*, is said to be provided with axillary flowers. Further on I will show that these flowers are in reality uniflorous inflorescences, and that the latter are not really axillary but borne on axillary brachyblasts provided with a pair of rudimentary leaves. All the same this plant represents a type which is quite distinct from that of the other species which up to that time had been recognized as belonging to this genus. In fact, it would probably have been more consistent if Valetton had referred it to *Psilobium*. The *Acranthera* species, which at that time were known, produce their inflorescences at the end of the stem. Later these inflorescences are forced into a lateral position by the development of the bud which forms the continuation of the stem. It is rather remarkable that the same two structural types occur side by side in another genus belonging to the Rubiaceae, namely in *Pomazota* Ridl., where some of the species are provided with sympodial stems and inflorescences which are at first terminal and afterwards solitary at the nodes, whereas in other species the stems are monopodial with the inflorescences opposite at the nodes, while a pair of scale-like leaves at the base of the peduncle prove that they are in reality borne on axillary brachyblasts. As stated above, it is inflorescences of this kind that are found in the Sumatran group of species of *Acranthera* to which, most probably, Jack's *Psilobium nutans* and *Ps. tomentosum* and Korthals's *Gonyanera glauca* too should be referred.

The next year Merrill described a species from the Philippines, which so far has remained the only representative of the genus occurring east of Borneo. *Acranthera philippinensis* Merr. appears to be confined to the western part of Mindanao, i.e. to that part which by means of the Sulu Islands is connected with North Borneo. In this respect it is noteworthy that it differs in minor points only from some of the Bornean species.

At about the same time Valetton described and figured in the "Icones Bogorienses" (4: 181. t. 355, 356. 1913; 4: 275. t. 391-399. 1914) a fairly considerable number of new Bornean species. The last plate figures a species described under the name *A. strigosa*, which differs from the others in the shape of the stipules and in the flower-structure. The stipules are united in a fringed sheath, and the style is longer than the stamens and, if the figure is to be trusted, not provided with an apparatus serving as a temporary depository for the pollen. It seems, therefore, better to exclude this species. The form of the stipules suggests affinity with *Polysolenia* Hook.f., but as neither of Valetton's nor Hooker's species-material was available to me, I am unable to express a definite opinion. *Acranthera multiflora* Val. (l.c. 255, t. 396) is probably identical with *A. frutescens* Val. (in Bot. Jahrb. 44: 551. 1910), at least the descriptions of the two species do not reveal differences of any importance.

In 1934, Merrill described two apparently nearly related species from Sumatra. As no flowers were present, the descriptions are not entirely satisfactory. Of one of them, however, flowers have subsequently been

collected, so that its position could definitely be ascertained. The relations between these plants and Jack's species of *Psilobium* and *Gonyanera glauca* Khs. have already been discussed.

Three years later Merrill (in Mitt. Inst. Allg. Bot. Hamburg 7: 284. 1937) reverted once more to this genus, describing four new species from Southwest Borneo. One of these proved to be provided with red, another with orange-red flowers.

The preceding notes show that twenty-five of the species which up to now have been referred to *Acranthera*, may confidently be regarded as true representatives of this genus, but as two of them, *A. frutescens* Val. and *A. multiflora* Val., are probably conspecific, only twenty-four are here admitted. To this number should be added the plant described by Kerr under the name *Psilobium siamense*, the species on which the genera *Psilobium* Jack and *Gonyanera* Khs. were based, but which, on account of the insufficiently detailed descriptions, are now unidentifiable, and further the ten species described below.

The specimens which I could study, belong almost all to the following four institutes: the "Rijksherbarium" at Leiden, the University Herbarium at Utrecht, the "Arnold Arboretum" and the "Institut für allgemeine Botanik, Hamburg." As I have seen but a small part of the Buitenzorg material and nothing at all from the collections of the Kew Herbarium and of the Sarawak Museum, my survey does not claim to be exhaustive.

In the descriptive part of this paper special attention has been paid to the species occurring in the Malay Archipelago, all those of which material was available, being fully described. No exception has been made for species of which good descriptions were already extant, because the descriptions in a monograph should, in my opinion, all be made after the same pattern; this is the only way to ensure an easy comparability.

#### THE TAXONOMIC POSITION OF THE GENUS

In the "Introduction" to this paper I have already pointed out that Arnott's assumption of a very close affinity between *Acranthera* and *Mussaenda* has up to now never been questioned. In Baillon's mind this belief had grown to such a firm conviction that he thought that the two genera might better be united. The common characters on which this assumption rests, are: the pluri-ovular ovary-cells, the valvate aestivation of the corolla-lobes, the fleshy pericarp, the axile placentas, the reddish brown seeds, and the terminal position and, at least partly, cymose structure of the inflorescence.

The bulk of the genera now referred to the tribes Hedyotideae and Mussaendeae are provided with pluri-ovular ovary-cells, show a valvate aestivation of the corolla-lobes, and have axile or nearly axile, peltate or subpeltate placentas and ovoid or angular, yellowish, reddish or brown, more or less distinctly alveolate, striate or punctate seeds. As the distinction between these two tribes rests on the entirely artificial antithesis:



fruits dry or fruits fleshy, I have argued in my paper "On Urophyllum Wall. (Rubiaceae) and its nearest allies" (in Rec. d. trav. bot. Néerl. 38: 171. 1940) that it would be advisable to unite them, under the proviso, however, that those genera in which one or more of the characters enumerated above are missing, should be excluded. As instances of such genera I referred to those provided with a clavate or columnar placenta and smooth seeds. In my recently published (Jour. Arnold Arb. 28: 186-203. 1947) "Monograph of the genus Pomazota Ridl." I give a short survey of the genera which for some reason or other should be excluded. *Acranthera* is not mentioned in this list, because its aberrant character is not so strongly marked as in the others. It is all the same by no means insignificant: its placentas, namely, are not peltate or subpeltate, but attached along their whole length to the dissepiment. It is, therefore, extremely questionable whether this genus may be reckoned to this circle of affinity. If it should be excluded, it can, of course, not be considered a near ally of *Mussaenda*, which is a quite typical representative. The other points of resemblance between *Acranthera* and *Mussaenda*, the fleshy fruits, the terminal position and, at least partially, cymose structure of the inflorescences, do not belong to the general characters of this large tribe, and as they appear in almost all the larger groups, are of little importance. The resemblance between the two genera, therefore, is not sufficiently comprehensive to be regarded as proof of their near affinity.

A survey of the points of difference between the two genera may be expected to throw more light on this question. The principal ones are found in: the structure of the stipules, the floral mechanism, the presence or absence of hairs on the inside of the corolla-tube, the insertion of the stamens, the relation between the latter and the style, the nature of the stigmata, the attachment of the placentas and the structure of the testa. In *Acranthera* the stipules are simple; the flowers homostylous and hermaphrodite; the corolla is completely glabrous inside; the stamens are inserted at the base of the tube; the anthers form a sheath around the style, and are connected by means of the projecting tips of the connectives with the top of the latter; the pollen is temporarily deposited on the upper part of the style, which, to that end, is covered by rows of papillae (for the sake of convenience this part of the style will from now on be designated as the "receptaculum pollinis"): from here it is removed by the visiting insects; the stigmata are subulate or semi-conical, and do not spread, not rarely remaining permanently attached to each other; the placentas, as stated above, are attached along their whole length to the dissepiment, and the testa-cells are minutely but very densely pitted (Fig. 1). In *Mussaenda*, on the other hand, the stipules are always bifid or bipartite; the flowers heterostylous, the short-styled ones being male and the long-styled ones female; the upper part of the corolla-tube is inside covered with yellow hairs; the stamens are inserted at or somewhat above the middle of the tube; there is no connection whatever between the anthers and the style, and the pollen is directly removed from the anthers to the stigmata:

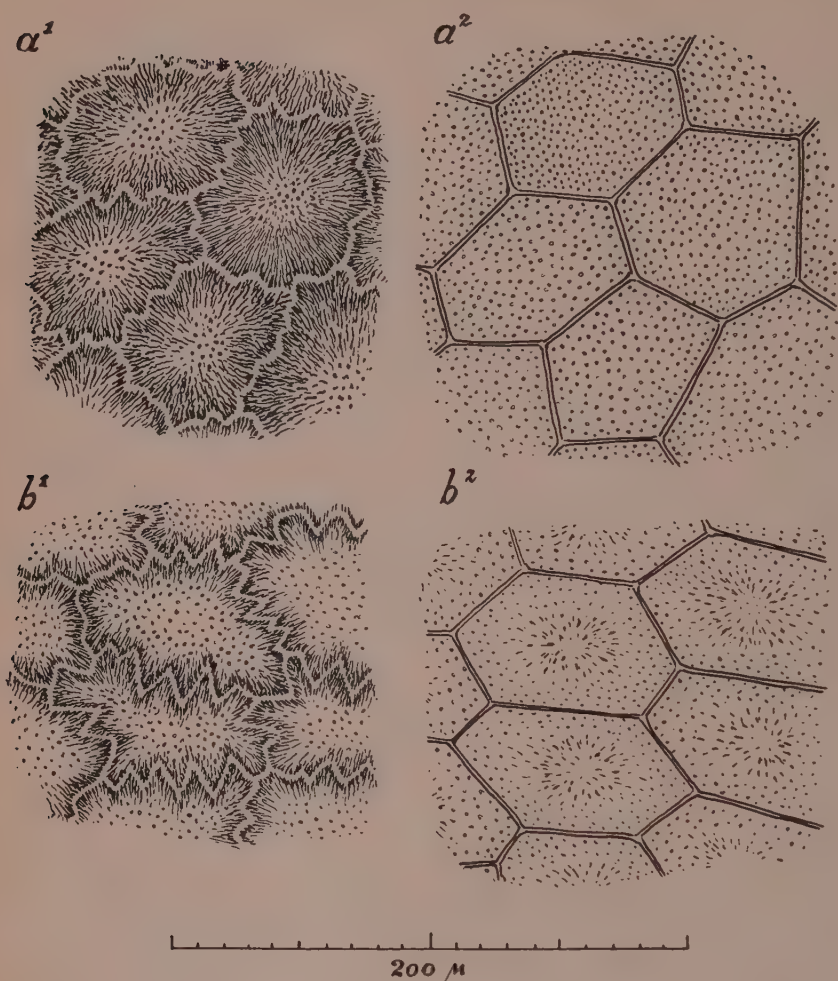


FIG. 1. Testa-cells of *Acranthera longipes* Merr. (a) and *A. siliquosa* Brem. (b). The cells consist almost entirely of the strongly thickened bottom-wall, which in (a) has the shape of a plano-concave, in (b) of a plano-convex lens; (a¹) and (b¹) show the deeper layers, in which the peripheral pit-canals converge towards the centre; (a²) and (b²) a surface view of the same cells; in (b²) the pit-canals in the central boss are seen to diverge a little.

the latter are, at least in the female flowers, always linear and spreading; the placentas are peltate, and the testa-cells provided with a few very large pits (Fig. 2).

These differences are, of course, not all equally important. The value of the difference in the attachment of the placentas to the dissepiment, has already been discussed; it certainly justifies some doubt with regard to the propriety of leaving the genus *Acranthera* in this tribe. The peculiar



kind of floral mechanism is an even more weighty argument against the view that it should belong to this group, for in none of the general related either to *Hedyotis* L., *Urophyllum* Wall., *Sabicea* Aubl. or *Mussaenda* L., a style functioning as a temporary depository for the pollen is found. As I have pointed out in my "Monograph of the genus *Pavetta* L." (in Fedde's Repert. 38: 11, 1934) a style of this nature characterizes one of the main

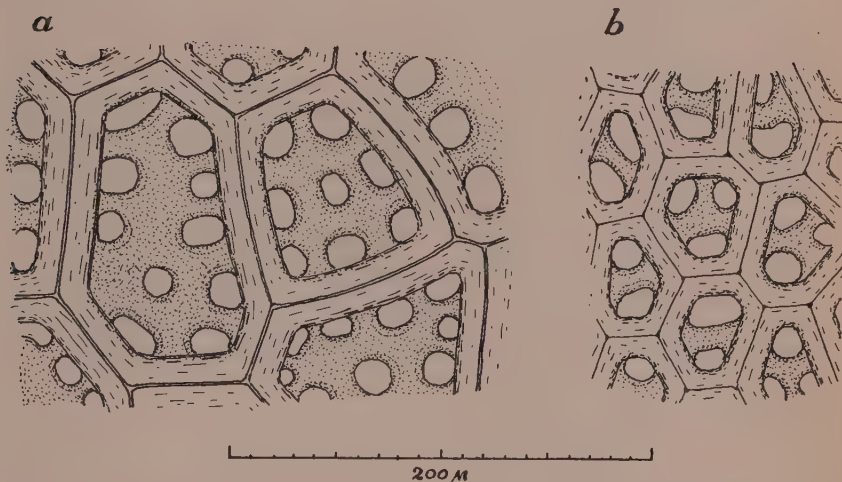


FIG. 2. Testa-cells of *Mussaenda frondosa* L. (a) and *M. cylindrocarpa* Burck (b). The side-walls too are strongly thickened, but pits are confined to the bottom-wall. The size of the cells and the number of pits differ considerably in the two species, but the pits themselves vary but little.

groups of the family, comprising the tribes Ixoreae, Gardenieae, Alberteae, Vanguerieae, the isolated genera *Crossopteryx* Fenzl and *Coptosapelta* Khs., and perhaps part of the present tribe Naucleae. In all these plants, however, the anthers wither after the pollen has been deposited on the style, whereas the *receptaculum pollinis* of *Acranthera* remains included between the empty anthers, and can be reached only through the windows between the projecting tips of the connectives. For this reason, and also because the stamens are not, as in the Ixoreae and their allies, inserted in the corolla-throat, but at the base of the tube, it seems to me that *Acranthera* can not be related to this group either. Moreover, the connection of the stamens by means of the projecting tips of the connectives with the top of the style is a feature so entirely unparalleled in the Rubiaceae, that one might feel inclined to regard the position of the genus with regard to the rest of the family, as similar to that of the Asclepiadaceae with regard to the Apocynaceae, although in this way the importance of the connection between the anthers and the style, is doubtless over-emphasized. It is perhaps more readily comparable to the way in which in the genera *Ceropegia* L. and *Dichaelia* Harv. (Asclepiadaceae) the corolla-tips cohere.

There is one point more on which I should like to expatiate a little, although it does not concern a difference between *Acranthera* and *Mussaenda*, for in the point I mean, the absence of raphide-cells, there is complete agreement between the two genera.

With regard to the presence or absence of raphide-cells there is no conformity between the various groups included in my enlarged tribe Hedyotideae, and as all other large groups are in this respect entirely consistent, this is doubtless a weak point. It might be argued that *Hedyotis* L. and its nearest allies, which are all provided with raphide-cells, are perhaps more closely related to the Spermacoceae and Psychotrieae, which they resemble in the aestivation of the corolla-lobes, but from which they differ in the pluri-ovular ovary-cells, than to *Sabicea* Aubl., *Urophyllum* Wall. and *Mussaenda* L. and their respective allies, which they resemble, apart from the aestivation of the corolla-lobes, to some extent in the nature of the placentation, but in which raphides are apparently always wanting. A satisfactory solution of this question can not yet be given. For the determination of the position to be assigned to *Acranthera*, this is not of paramount importance, as the relations between this genus and the various groups in which raphides are wanting, are hardly more pronounced than those with *Hedyotis*.

#### THE SUBDIVISION OF THE GENUS

Up to now no attempt has been made to arrange the species of *Acranthera* in natural groups. Valetton, who at one time (in Ic. Bog. 4: fasc. 4. 1914) described no less than nine new species, contented himself with an alphabetical arrangement! This apparently means that he had not been able to distinguish well-defined groups, and was of opinion that the best way to make the species distinguishable, was to figure them, which he accordingly did with as many as he could lay hands on. The result is that of no other rubiaceaceous genus of any extent has such a large percentage of the species been figured (of the 20 species known in 1914 e.g. no less than 14, i.e. 70 per cent). These efforts, however, were, I am afraid, of little avail, for even with the aid of the pictures the species are by no means easily recognizable. It was to be expected, therefore, that a more thorough analysis would lead to better results. On account of the fact that not all species were available, and also because on some points, for instance on the habit and on the flower-colour, reliable information could not always be obtained, the results are not yet fully satisfactory; but I have no doubt that as soon as more material is forthcoming, the defects of my classification will easily be amended.

It is here perhaps the most suitable place to make a few remarks on the two points just mentioned, the habit and the flower-colour.

A good deal of misapprehension has existed up to now with regard to the habit of these plants. On the labels they are not rarely described as shrubs and in one case even as a small tree (*A. longipes* Merr.), but these



indications should not be taken at their face value. It is a well-known fact that European collectors, accustomed to the soft shoots of the herbs of their native countries, often take tropical herbs for shrubs, even though there is no sign of branching, because they are misled by the woodiness of the stems. The indication "small tree" on the label of some of the specimens of *A. longipes* Merr., on the other hand, is doubtless a faulty translation of the "pohon ketjil" of the Malay collector. It is often overlooked that in Malay each plant provided with an erect stem is called "pohon," no matter whether it is an herb a few centimeters high and without a single branch or a tree with a large crown.

Stapf was doubtless right when he described the habit of the *Acranthera* species as herbaceous. Among all the specimens investigated by me, but very few were branched, and in these few exceptions the ramification was always of the pseudo-dichotomous kind. They belong to species in which the stems normally are sympodial. This means that occasionally at the base of the inflorescence instead of one bud both buds develop. Even those species which, like *A. frutescens* Val., reach a fairly considerable height (1.5–2 m.), apparently remain unbranched. It is not impossible that the larger plants require more time to complete their life-cycle than those that remain lower, but no reliable information with regard to this point seems to be available. In some species there are indications that the stems in the end sink down, and that innovations are produced from their basal parts.

Our information with regard to the flower-colour too is far from complete. This is all the more unfortunate as it looks as if this might be of real taxonomic importance.

The three western species are blue-flowered. The flower-colour is unknown to me, of the Assam *A. tomentosa* R.Br. ex Hook.f. but in the nearly related *A. siamensis* (Kerr) Brem. the flowers are white. The first of the species described from Borneo, *A. atropella* Stapf, was said to be provided with a dark blue corolla, but, as stated above, this is probably a mistake. The majority of the Bornean species and the only Philippine one possess white or slightly tinted flowers; in the rest of the Bornean species the corolla is yellow, orange or red. In these plants the calyx too is often coloured, not rarely in a different shade. With regard to the flower-colour of the Sumatran species we are insufficiently informed, but those of Brooks's Benkulen species, the one that was identified by Ridley as *Psilobium nutans* Jack, are stated to be greenish white.

The characters with which we will mainly have to be content, are: the shape and size of the stipules, the position and form of the inflorescences, the shape of the corolla-tube, the fusion or complete freedom of the basal parts of the stamens, the presence or absence of a fringe of cilia between the outer rim of the thecae and the connective, the shape of the latter, the presence or absence of a disk, the form of the *receptaculum pollinis*, the structure of the fruit and that of the testa. By the aid of these characters I have divided the genus in nine subgenera, of which the first,

*Eu-acranthera*, is confined to Ceylon and the Indian Peninsula, the second, *Androtropis*, to Assam and Peninsular Siam, the fourth, *Amphoterosanthus*, to Sumatra, and the others to Borneo, except the eighth, *Mitracme*, which contains, besides some Bornean species, the only representative of the genus found in the Philippines.

*Eu-acranthera* and *Androtropis* differ from all the other subgenera by the presence of a well-developed disk. In *Eu-acranthera*, moreover, the corolla is blue and its tube begins with a cylindrical part, which widens in the upper half to funnel-shape, whereas in the other subgenera the corolla is presumably never blue, and its tube is either entirely funnel-shaped or, more often, narrowly campanulate. *Androtropis* differs from the other subgenera in the presence of a staminal tube formed by the basal halves of the filaments; in all other subgenera the filaments are entirely free.

The third subgenus, *Cleomocarpus*, differs from the other subgenera in the structure of the fruits, which are narrowly cylindrical and marginate, the hardened margin remaining after the seeds have been shed, in the form of a "replum." The latter, however, is morphologically not equivalent to the replum of the herbaceous Capparidaceae, the Cruciferae and *Chelidonium*, for in these plants the rim is formed by the fused margins of the carpels, whereas in the subgenus *Cleomocarpus* of the genus *Acranthera* it represents the midribs of the carpels. The dissepiment, accordingly, is not, as in the Cruciferae, attached to the rim, but stands at right angles with it; in the end the dissepiment disappears with the valves. The stipules of *Cleomocarpus* are smaller than those found in any other subgenus; in shape, however, they are not unlike those of the subgenera *Eu-acranthera*, *Androtropis* and *Amphoterosanthus*. Its two species are nearly glabrous plants with densely reticulated leaves.

The fourth subgenus, *Amphoterosanthus*, is confined to Sumatra and the neighbouring island Simalur. It resembles the three preceding subgenera in the triangular shape of the stipules, but differs from them in the position of the inflorescences, which are borne on opposite brachyblasts provided with a pair of rudimentary leaves. The inflorescences themselves are few-flowered. In position and structure they are similar to those found in some species belonging to the subgenus *Dichroanthes* and to those of *Ablepharidesma*. The seeds are reticulate, whereas in almost all other species of which ripe fruits were available, the seeds were found to be either distinctly carunculate or nearly smooth. There is, however, no difference of fundamental importance between the various kinds of seed. The two species of *Psilobium*, described by Jack, and *Gonyanera glauca* Khs. belong probably to this subgenus. As no specimens are extant, and as the plants are not identifiable from the descriptions, it did not seem advisable to retain either of these names for the denomination of the subgenus.

In the other subgenera the stipules are wider and longer than in the preceding ones, and of an entirely different shape, namely ovate, elliptic or oblong. The differences between these subgenera are not so striking as



those between the former. They are mainly confined to the position and structure of the inflorescence, the shape of the *receptaculum pollinis* and the presence or absence of a fringe of cilia between the thecae and the connective. *Athroophleps*, however, is well characterized by the peculiar nature of the reticulation. It is noteworthy that with regard to the shape of the *receptaculum pollinis* and to the presence or absence of a fringe of cilia along the connective, the first four subgenera, *Eu-acranthera*, *Androtropis*, *Cleomocarpus* and *Amphoterosanthus*, show a uniform character: their anthers are always eciliolate, and the *receptaculum pollinis* is everywhere fusiform, and of about the same length as the thecae.

In the three subgenera *Phanerochiton*, *Dichroanthes* and *Ablepharidesma* too the *receptaculum pollinis* is of about the same length as the thecae, and either fusiform or cylindrical. In *Phanerochiton* and *Dichroanthes* the anthers are ciliolate, in *Ablepharidesma* eciliolate. The monotypic subgenus *Phanerochiton* differs from the two others in the long, scarious stipules, the trichotomous inflorescence with its large bracts and the thick-walled fruit, and from all other representatives of the genus in the presence of dark-coloured resin-cells on the upper side of the leaves. In *Dichroanthes* the filaments are about as long as the anthers, the *receptaculum pollinis* cylindrical, and the flowers often, perhaps even always, gaily coloured, the corolla yellow, orange or red, and the calyx white or in a different shade of orange or red. In the other Bornean species the filaments are always much shorter than the anthers, and the corolla is apparently everywhere either white or but slightly tinted. *Dichroanthes* is divided in two series, one with terminal inflorescences and cohering stigmata, the other with inflorescences borne on opposite brachyblasts and with free stigmata. In *Ablepharidesma* the inflorescences are few-flowered and borne on opposite brachyblasts, the anthers eciliolate, the shoots thin, and the leaves and stipules small.

In the subgenus *Mitracme* the *receptaculum pollinis* is much shorter than the thecae and mitriform, i.e. the papillae are reclinate and increase from the top towards the base of the receptaculum gradually in length. In this subgenus I distinguish four series. In the first series the anthers are ciliolate, whereas in the other three they are always eciliolate; the species belonging to this series are robust plants with large trichotomous inflorescences provided with large bracts. The second series is monotypic, the only species being the Philippine *A. philippinensis* Merr.; it is a low plant with a trichotomous inflorescence provided with well-developed bracts. The third series is also monotypic, the only species being a narrow-leaved plant with few-flowered inflorescence and small bracts. The fourth series comprises plants with umbelliform inflorescence, in habit not unlike some of the species belonging to the subgenus *Dichroanthes*.

The last subgenus, *Athroophleps*, is a small but very natural group, confined to North Borneo and easily recognizable by the peculiar arrangement of the thick-set prominulous venules, which form narrow meshes,

stretched in a transverse direction. In *A. capitata* Val. this curious arrangement was noticed already by Valeton (cf. Ic. Bog. 4: 276 (line 6), t. 391, fig. 12. 1914). In none of the other subgenera are the meshes stretched in this direction, and except in *Cleomocarpus*, where the reticulation, however, is very faint, their number is always much smaller. Other peculiarities of this subgenus are the annular shape of the *receptaculum pollinis* and the great length of the points in which the connectives are drawn out.

#### DESCRIPTIO GENERIS\*

*Acranthera* Arn. ex Meisn., Pl. Vasc. Gen. 1: 162, 2: 115. 1838; Arn. in Ann. Nat. Hist. 3: 20. 1839; Endl., Gen. Pl. 1394. 1839; non Kurz in Jour. As. Soc. Bengal 41 (2): 312. 1872, nam specimen citatum ad Aphaenandram Miq. pertinet; Hook.f. in Benth. & Hook.f., Gen. Pl. 2: 64. 1873; Bedd., Ic. Pl. Ind. Or. 1: 5, t. 23-25. 1874; Hook.f., Fl. Brit. Ind. 3: 92. 1880, *A. Griffithii* Hook.f. et *A. Maingayi* Hook.f. quae ad genus Asemanthiam Ridl. ducendae sunt exclusis; non Hemsl. in Jour. Bot. 25: 204. 1887, nam specimen citatum ad Asemanthiam Maingayi (Hook.f.) Ridl. pertinet; K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. IV. 4: 63. 1891; Trimen, Handb. Fl. Ceylon 2: 324. 1894; Stapf in Trans. Linn. Soc. Bot. II, 4: 173. 1894; Val. in Bot. Jahrb. 44: 550. 1910, 48: 111. 1912; Merr. in Philip. Jour. Sci. Bot. 8: 32. 1913; Val. in Ic. Bog. 4 (3): 181, t. 355, 356. 1913, 4 (4): 275, t. 391-398. 1914, *A. strigosa* Val. p. 391, et t. 399, excl.; Gamble, Fl. Pres. Madras 2: 611. 1921; Lemée, Dict. Pl. Phan. 1: 45. 1929; Merr. in Papers Mich. Acad. Sci. 19: 194. 1934 et in Mitt. Inst. Allg. Bot. Hamburg 7: 284. 1937.

*Mussaenda* spec., Baill., Hist. Pl. 7: 319, 449. 1880.

*Psilobium* Jack, Mal. Misc. 2: 84. 1822 (etiam in Calc. Jour. Nat. Hist. 4: 27. 1843); DC, Prodr. 4: 618. 1830; Roxb., Fl. Ind. ed. Wall. 2: 320. 1832; Miq., Fl. Ind. Bat. 2: 199. 1857; Hook.f. in Benth. & Hook.f., Gen. Pl. 2: 75. 1873; Boerl., Handl. Fl. Ned. Ind. 2: 64. 1891; K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. IV. 4: 70. 1891; Lemée, Dict. Pl. Phan. 5: 629. 1934, nomen vix usum et typo perditum haud facile definiendum, igitur melius rejectandum; non Kurz in Jour. As. Soc. Bengal 41 (2): 313. 1872, nam specimen citatum ad genus Morindopsem Hook.f. pertinet; Ridl. in Kew Bull. 1925: 84. 1925; Kerr in Hook., Ic. Pl. t. 3332. 1937, nomine generico recte usi sunt.

*Gonyanera* Khs. in Ned. Kruidk. Arch. 2 (2): 183. 1851; Miq., Fl. Ind. Bat. 2: 200. 1857; Hook.f. in Benth. & Hook.f., Gen. Pl. 2: 75. 1873; Boerl., Handl. Fl. Ned. Ind. 2: 64. 1891; K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. IV. 4: 70. 1891; Lemée, Dict. Pl. Phan. 3: 316. 1932, nomen typo perditum haud facile definiendum et igitur neglectandum.

Herbae plerumque simplices, rarius pseudo-dichotome ramificatae, subrosulares, ascendentes vel suberectae, basi lignescentes. Caulis plerumque sympodialis, obtuse quadrangularis, internodiis bisulcatis. Folia opposita et aequalia, petiolata; lamina plerumque oblanceolata vel obovata, apice acuminata, margine anguste membranacea ciliata, substrigosa vel strigosa, facie ventrali sub lente albido-granulata, costa nervisque subtus plerumque pilosis, raphidibus et acaridomatiis nullis. Stipulae interpetiolares, simplices, extus haud raro colletris subulatis sparsae, intus glabrae. In-

\* The abbreviations for the herbaria of the institutions cited in this paper are as follows: AA=Arnold Arboretum; BD=Bot. Mus., Berlin-Dahlem; BZ=Buitenzorg Botanic Garden; HGB=Inst. Allg. Bot., Hamburg; L=Rijksherbarium, Leiden; U=Bot. Mus., Utrecht.



florescentiae plerumque apice caulis evolutae, casu quo a ramulo axillari mox in positionem lateralem coactae, rarius ramulos abbreviatis (brachyblastos) oppositis, foliis duobus rudimentariis instructis terminantes; flores paniculati, cymosi vel cymoso-umbellati, rarius solitarii, pedicellati vel subsessiles; bractee variae. Flores hermaphroditi, plerumque 5-, raro 4-meri, aliqui interdum 6-meri. Ovarium plerumque elongatum, rarius turbinatum, biloculare, dissepimento plerumque tenui et faciliter discindente; placentae utroque loculo duae, prope axem orientes et ei parallelae, rarius confluentes, per totam longitudinem dissepimento affixae; ovula numerosissima. Calyx usque ad basin partitus, corollae tubo plerumque subaequilongus; lobi haud raro paulum inaequilati; glandulae interlobulares plerumque conspicuae. Corolla colore variabili, extus plerumque pilosa, intus semper glaberrima; tubus nunc e basi cylindrica infundibuliformis, nunc totus infundibuliformis vel anguste campanulatus; lobi patentes, aestivatione reduplicato-valvata. Stamina basi corollae inserta, tubo plerumque inclusa, rarius breviter exserta; filamenta glabra vel rarius papillosa, plerumque libera, raro usque ad medium connata; antherae lineares, conjuncte stylum includentes, introrsae, thecis facie ventrali contiguis, connectivo faciem dorsalem totam complente, haud raro gibboso vel carinato, margine interdum ciliolato, apice in apiculam vel aristam apici styli incumbentem et cum eo cohaerentem producto. Discus nunc breviter cylindricus vel semi-globosus, nunc inconspicuus. Stylus staminibus aequilongus, parte superiore papillis plerumque 10-seriatim dispositis oblecta pro receptaculo pollinis agente, apice in stigmata subulata vel semi-conica parallela vel confluentes exeuns. Fructus ovoideus, turbinatus vel cylindricus, plerumque baccatus, raro plus minusve capsularis, semper calyce coronatus. Semina parva et numerosissima, rubro-brunnea vel subnigra, paulum compressa, carunculata vel reticulata, testae cellulis semper densissime punctatis, albumine carnosio, embryone recto et parvo.

Distributum speciebus adhuc certe notis 35 in umbra nemorum Ceylaniae, Peninsulae Indicae, Assamiae, Siamiae Peninsularis, Sumatrae, terrae Borneënsis, insulae Filippinae Mindanao dictae.

Species typica: *A. ceylanica* Arn. ex Meisn.

#### KEY TO THE SUBGENERA

Disk shortly cylindrical or semi-globose. Inflorescences always at the end of the stem. — Species from Ceylon, the Western Ghats, Assam and Peninsular Siam.

Corolla blue; basal part of the tube cylindrical, upper part infundibuliform.

Filaments free. — Species from Ceylon and the Western Ghats... *A. Eu-acranthera*

Corolla (always?) greenish; tube entirely infundibuliform. Filaments in the lower half connate. — Species from Assam and Peninsular Siam... *B. Androtropis*

Disk inconspicuous. Inflorescences either at the end of the stem or borne on opposite brachyblasts provided with two rudimentary leaves. — Species from the Malay Archipelago (Sumatra, Borneo, Mindanao).

Stipules triangular, at the most 1.5 cm. long, usually much shorter.

Stipules not more than 3 mm. long. Inflorescences at the end of the stem.

Fruits bicostate; the ribs after the shedding of the seeds remaining behind in the form of a replum. Seeds carunculate. — Bornean species.....

..... *C. Cleomocarpus*

Stipules 7–15 mm. long. Inflorescences at the end of opposite brachyblasts provided with rudimentary leaves, few-flowered. Fruits 5- or 6-costate.

Seeds reticulate. — Species from Sumatra and Simalur... *D. Amphoterosanthus*

Stipules ovate, elliptic or oblong, usually more than 1.5 cm. long, if somewhat shorter (e.g. subgenus *Ablepharidesma*), then at least with the greatest width near the middle and several times longer than the diameter of the stem.

*Receptaculum pollinis* as long as or but slightly shorter than the thecae, and either cylindrical or fusiform.

Connective ciliolate.

Leaves on the upper side dotted with dark-coloured resin-cells. Inflorescences either trichotomous with fairly long primary branchlets or, by the suppression of the lateral branchlets, long-pedunculate. Bracts large. Corolla reddish.—A single Bornean species.....

.....E. *Phanerochiton*

Inflorescences either umbelliform or reduced to a single flower, always subsessile. Bracts small. Corolla yellow, orange or red.—Bornean species.....

.....F. *Dichroanthos*

Connective eciliolate. Inflorescences borne on opposite brachyblasts provided with rudimentary leaves, few-flowered. Corolla white.—Bornean species.....

.....G. *Ablepharidesma*  
*Receptaculum pollinis* much shorter than the thecae, either mitriform or annular. Inflorescences always at the end of the stem.

Reticulation lax; the smaller venules not or but slightly prominent.

*Receptaculum pollinis* mitriform.—Species from Borneo and Mindanao.....

.....H. *Mitracme*

Meshes of the reticulation small and stretched in a transverse direction; the venules themselves prominulous. *Receptaculum pollinis* annular.—

Confined to North Borneo.....I. *Athrophleps*

#### SUBGENUS A. EU-ACRANTHERA BREM. SUBGEN. NOV.

Herbae humiles, caule petiolisque pilosis. Folia laxe reticulata. Stipulae ovato-triungulares, internodiis breviores. Inflorescentia terminalis, trichotome corymbosa. Corolla coerulea vel violacea, tubo e basi cylindrica infundibuliformi, quam calyce multo longiore. Stamina filamentis papillois, liberis, quam antheris longioribus, antheris eciliolatis. Discus breviter cylindricus. Receptaculum pollinis fusiforme. Fructus ovoideus. Semina carunculata.

Species tres, Ceylaniam et Peninsulam Indicam habitantes, ubi in altitudine 900–1500 m. cresunt. Subgeneris typus: *A. ceylanica* Arn. ex Meisn.

#### KEY TO THE SPECIES

Calyx-lobes obovate, spreading; anthers shortly apiculate.—Indian Peninsula.....

.....1. *A. anamallica*  
Calyx-lobes linear-lanceolate or narrowly triangular, erect; anthers aristate.

Leaves subglabrous on the upper side; calyx-lobes linear-lanceolate; corolla-tube 4 cm. long.—Indian Peninsula.....

.....2. *A. grandiflora*

Leaves distinctly hairy on the upper side; calyx-lobes narrowly triangular; corolla-tube 2 cm. long.—Ceylon.....

.....3. *A. ceylanica*

1. *Acranthera anamallica* Bedd., Ic. Pl. Ind. Or. 1: 5, t. 23. 1874; Hook.f., Fl. Brit. Ind. 3: 93. 1880; Gamble, Fl. Pres. Madras 2: 611. 1921.—Indian Peninsula (Western Ghats).

2. *Acranthera grandiflora* Bedd., Ic. Pl. Ind. Or. 1: 5, t. 25. 1874; Hook.f., Fl. Brit. Ind. 3: 93. 1880; Gamble, Fl. Pres. Madras 2: 611. 1921.—Indian Peninsula (Western Ghats).



3. *Acranthera ceylanica* Arn. ex Meisn., Pl. Vasc. Gen. 2: 115. 1838.

*Acranthera zeylanica* Arn. in Ann. Nat. Hist. 3: 21. 1839; Walpers, Repert. 6: 77. 1846; Thwaites, Enum. Pl. Zeyl. 138. 1860; Bedd., Ic. Pl. Ind. Or. 1: 5, t. 24. 1874; Hook.f., Fl. Brit. Ind. 3: 92. 1880; Trimen, Handb. Fl. of Ceylon 2: 324. 1894.—Ceylon.

As no material of *A. anamallica* and of *A. grandiflora* was available to me, the key was based on data gathered from the literature.

SUBGENUS B. ANDROTROPIS (R.Br. in Wall. Cat. n. 8398, gen. inedit.)

Herbae altiores. Folia laxe reticulata. Stipulae ovato-triangulares, internodiis multo breviores. Inflorescentia terminalis, corymbosa. Corolla ubi color notus viridula, tubo infundibuliformi, quam calyce longiore. Stamina filamentis glabris, usque ad medium connatis, quam antheris longioribus, antheris eciliolatis. Discus breviter cylindricus vel semiglobosus. Receptaculum pollinis fusiforme. Fructus cylindricus, 5-costatus. Semina carunculata.

Species duae, Assamiam et Siamiam Peninsularem habitantes. Subgeneris typus: *A. tomentosa* R.Br. ex Hook.f.

## KEY TO THE SPECIES

Leaves strigose on the upper side. Corolla more than 3 cm. long.—Assam.....

.....4. *A. tomentosa*

Leaves glabrous on the upper side or near the margin and towards the base strigose.

Corolla about 2 cm. long.—Peninsular Siam.....5. *A. siamensis*

4. *Acranthera tomentosa* R.Br. ex Hook.f., Fl. Brit. Ind. 3: 92. 1880 (*Androtropis tomentosa* R.Br. in Wall. Cat. n. 8398, nomen).—Assam.

5. *Acranthera siamensis* (Kerr) Brem. n. comb.

*Psilobium siamense* Kerr in Hook., Ic. Pl. t. 3332, 1937.—Peninsular Siam.

Of *A. tomentosa* I had but a single, not very good, specimen, whose flowers were much larger than those of the specimens described by Hooker. Fruits of this species were not available to me.

For *A. siamensis* I relied on the detailed description given by Kerr and on the excellent plate by which the latter is accompanied. Kerr referred this species to *Psilobium* Jack, because it resembles the specimen collected by Brooks in Benkulen, which Ridley (in Kew Bull. 1925: 84. 1925) had identified as *Ps. nutans* Jack, but which is probably a different species (see above). The near affinity between the Siamese plant and *A. tomentosa* R.Br. ex Hook.f. was overlooked by the author.

Kerr ends his description with the following remark: "It seems probable, judging from a cursory examination, that some plants assigned to *Gardenia*, Section *Gardeniella*, should rather be referred to *Psilobium*."

The section *Gardeniella* was created by Ridley (Fl. Mal. Pen. 2: 80. 1923), who referred to it four species from the Malay Peninsula, which show but little resemblance to the typical representatives of the genus *Gardenia*. The possibility that they might belong to *Acranthera*, of which representatives are found both to the North and to the South of the Malay Peninsula, certainly deserves our attention. Judging from the somewhat

meagre descriptions, I do not believe however that anyone of them can be transferred to this genus. The first, *G. tentaculata* Hook.f. is described by Ridley as a "bush," a habit which is entirely unknown in *Acranthera*; its stipules, apparently, are similar to those of *A. strigosa* Val., a species which in my opinion does not belong to this genus. The three other ones seem to be unbranched, but they differ from all species of *Acranthera* known so far in the position of the inflorescences: the latter, namely, are found on the defoliated part of the stem. In two of them, *G. virescens* Ridl. and *G. pulchella* Ridl., the stipules, moreover, are like those of *G. tentaculata* "fringed with long points." The last one, *G. didymocarpus* Ridl., had provisionally been referred by H. H. W. Pearson to *Acranthera*. Its removal by Ridley to *Gardenia* evidently means that it does not fit the description of *Acranthera*. It is possible, however, that Ridley was influenced by the lateral position of the inflorescences.

SUBGENUS C. CLEOMOCARPUS BREM. SUBGEN. NOV.

Herbae ascendentes vel suberectae, subglabrae. Folia dense sed vix conspicue reticulata. Stipulae breviter et late triangulares, in cupulam brevem connatae, apiculatae, usque ad 3 mm. altae, persistentes. Inflorescentia terminalis. Corolla alba, extus glabra, tubo campanulato. Stamina filamentis glabris et liberis, quam antheris multo brevioribus, antheris connectivo carinato, eciliolato. Discus inconspicuus. Receptaculum pollinis fusiforme. Fructus cylindricus, bicostatus, glaber, costis maturitate repli instar remanentibus. Semina carunculata.

Species duae terrae Borneënsis partes septentrionalem et orientalem habitantes. Subgeneris typus: *A. siliquosa* Brem. n. spec. v. infra.

KEY TO THE SPECIES

Leaves with 10-12 pairs of nerves. Inflorescence laxly paniculate, many-flowered. — East Borneo.....6. *A. siliquosa*  
 Leaves with 6-8 pairs of nerves. Inflorescence cymose, 2- to 7-flowered. — North Borneo.....7. *A. ophiorrhizoides*

6. *Acranthera siliquosa* Brem. n. spec.; typus: *Endert 3368* (BZ).

Herba suberecta, usque ad 2.5 m. alta. Caulis sympodialis, diametro ad apicem 2 mm. basin versus usque ad 5 mm. aucto, glaberrimus, sicc. fuscescens, internodiis 2-7.5 cm. longis. Folia petiolo 2-6 cm. longo, glaberrimo instructa; lamina oblonga vel obovata, 12-24 cm. longa et 5-8.5 cm. lata, apice caudato-acuminata, basi cuneata vel contracta, margine pilis brevibus sparse et vix conspicue strigosa, ceterum glaberrima, membranacea, utrimque opaca, sicc. supra saturate olivacea, subtus dilute olivacea vel olivaceo-brunnea, nervis plerumque saturate olivaceo-brunneis distincte notata, nervis utroque latere costae 10-12. Stipulae apiculo incluso 3 mm. altae, costa et basi incrassatae, totae glabrae. Inflorescentia breviter pedunculata, laxè paniculiformis, glabra; pedunculus 5-15 mm. longus; rachis 7-12 cm. longa; ramuli ultimi monochasiales, post anthesin maxime 1 cm. longi et cicatricibus maxime 5 notati; bracteae ramulorum primariorum subulatae, 5 mm. longae, aliae minores, ultimae vix 1 mm. longae, omnes subpersistentes. Flores subsessiles; pedicelli post anthesin



tamen usque ad 5 mm. elongantes. Ovarium cylindricum, circ. 10 mm. longum et vix 0.5 mm. diam., glabrum. Calycis lobi lineares, 7 mm. longi et 0.5 mm. lati, acuti, glabri. Corollae tubus 10 mm. longus et 4 mm. diam.; lobi 2.5 mm. longi latique, mucronati. Stamina 6.5 mm. longa; filamenta 1 mm.; antherae 5.5 mm. longae, connectivo in appendicem rectam 0.5 mm. longam exeunte. Stylus in stigmata subulata, 0.7 mm. longa exeuns. Fructus 4 cm. longus et 1.5 mm. diam., viridis.

Habitat terrae Borneënsis partem orientalem.

BORNEO: Eastern and Southern Division. West Kutai: Liak Petak, alt. 450 m., *Enderit* 3368 (BZ, typus); ibidem, Liak Leng, alt. 250 m., *id.* 2998 (BZ, co-typus fructifer).

7. *Acranthera ophiorrhizoides* Val. in Ic. Bog. 4: 287, t. 397. 1914. — North Borneo.

I am not fully certain that this species, of which no material was available, really belongs to *Cleomocarpus*. It resembles *A. siliquosa* in the nature of the stipules, the nearly glabrous leaves, the terminal inflorescence and the small size and white colour of the flowers. The fruits are imperfectly known; in Valeton's specimens they were apparently immature, and with regard to the presence or absence of a replum there is, therefore, no certainty. The anthers have been described as bearded, and figured as ciliolate, but I suppose they are neither. Valeton's specimens were apparently badly preserved, and it is, therefore, quite possible that the presence of cilia was simulated by the mycelium of a fungus with which the anthers were overgrown.

#### SUBGENUS D. AMPHOTEROSANTHUS BREM. SUBGEN. NOV.

Herbae altiores. Folia supra glaberrima, laxe reticulata. Stipulae triangulares, in cupulam brevem connatae, apice appendiculatae, internodiis multo breviores, persistentes. Inflorescentiae brachyblastos oppositos, foliis rudimentariis instructos terminantes, pauciflorae. Calycis lobi lanceolati vel ovati. Corolla in specie sola ubi color notus est viridula; tubus campanulatus. Stamina filamentis glabris et liberis, quam antheris brevioribus, antheris ecilolatis, connectivo carinato instructis. Discus inconspicuus. Receptaculum pollinis fusiforme. Fructus cylindricus, 5-vel 6-costatus. Semina reticulata.

Species adhuc certe notae tres Sumatram et insulas ad occasum habitantes. Subgeneris typus: *A. longipes* Merr.

As the two *Psilobium* species of Jack and Korthals's *Gonyanera glauca* are provided with "axillary" inflorescences or flowers and elongated ovaries and fruits, there can be little doubt that they belong to this subgenus. The exerted sexual organs distinguish them from *A. longipes* Merr., the only species of which flowers were available. The description of *Psilobium nutans* Jack says that the leaves are lanceolate and smooth, and that the peduncles bear three to six flowers, whereas in *Ps. tomentosum* Jack the inflorescences are apparently uniflorous and the leaves tomentose. The leaves of *Gonyanera glauca* Khs. are said to be elliptic and the calyx-lobes ovate, and the inflorescences of this species too appear to be uniflorous. That these meagre indications would suffice for the identification of these species, seems excluded.

## KEY TO THE SPECIES

Shoots, petioles and fruits glabrous. Petioles 4.5–9 cm.; lamina 25–32 cm. long.— East Sumatra.....8. *A. longipes*  
 Shoots, petioles and fruits strigose. Petioles not more than 3 cm.; lamina not more than 20 cm. long.

Stipules 10–15 mm. long. Calyx-lobes ovate-oblong, 6 × 4 mm.— East Sumatra. ....9. *A. Yatesii*

Stipules 7–10 mm. long. Calyx-lobes linear-lanceolate, 12 × 2.5 mm.— Siamalur. ....10. *A. simalurensis*

8. *Acranthera longipes* Merr. in Papers Mich. Acad. Sci. 19: 193. 1934; non Merr. in Mitt. Inst. Allg. Bot. Hamburg 7: 284. 1937, homon. illeg. (cf. *A. longipetiolata* Merr. ex Brem. n. nom.).

Herba robusta sed altitudine ignota. Caulis mox totus glaber, diametro ad apicem 2.5 mm., basin versus usque ad 8 mm. aucto, internodiis 1–2.5 cm. longis. Folia petiolo 4.5–9 cm. longo, glabro instructa; lamina oblanceolata, 25–32 cm. longa et 7.5–10 cm. lata, apice breviter vel longius acuminata, basi acuta vel cuneata, margine pilis brevibus vix conspicue strigosa, subtus primum costa nervisque densius, inter nervos sparse, deinde costa nervisque sparse strigosa, utrimque opaca, sicc. supra olivaceo-brunnea, subtus fusca, nervis utroque latere costae plerumque 11. Stipulae 5–7 mm. longae et 6–7 mm. latae, apice colletris pluribus et infra apicem fasciculo pilorum instructae. Inflorescentiae basi foliis rudimentariis 2.5 mm. longis instructae, 3-florae; bractae florum lateralium lanceolatae, 5 mm. longae. Flores pedicello strigoso, 2.5 mm. longo et lat. Ovarium cylindricum, 10 mm. longum et 1 mm. diam., strigosum. Calycis lobi oblanceolati, 7.5 mm. longi et 1.8 mm. lati, acuti, utrimque glabri, 7-nervii. Corolla colore ignoto, 14.5 mm. longa; extus glabra; tubus 12 mm. longus et 7 mm. diam.; lobi late ovati, 5 mm. lati et 2.5 mm. longi. Stamina 8.5 mm. longa; filamenta 2 mm.; antherae 6.5 mm. longae, connectivo in apiculam brevem producto. Receptaculum pollinis 5.5 mm. longum, apice acuto bifido. Fructus 4–4.5 cm. longus et 3 mm. diam., glaber, pericarpio tenui.

Habitat Sumatram Orientalem.

SUMATRA: East Coast Gouv't: Asahan, Merbau, Bila, near Bila Pertama (Perbarian), *Rahmat* 3.5 (AA, dupl. typi fructiferi); ibidem, near Lumban Ria, *id.* 7431 (AA); ibidem, near H. Bagasan, *id.* 6832 (AA), 7231 (AA, co-typus meus florifer).

Vernacular names: *kaju lambok*, *kaju si martumbus*.

9. *Acranthera Yatesii* Merr. in Papers Mich. Acad. Sci. 19: 193. 1934. — East Sumatra.

This species, which I could not investigate myself, differs from *A. longipes* in the much shorter petioles, the smaller size of the leaves and their more conspicuously pilose underside, in the up to 1.5 cm. long stipules, the ovate-oblong calyx-lobes and the hairy fruits. From *A. simalurensis* it differs in the larger size of the stipules and in the shorter and wider calyx-lobes. It was collected in the same region as *A. longipes*, namely in the East Coast Gouvernement (District Pematang Siantar, Dk Tinggi Radja, alt. 500 m., *Yates* 2153). The flowers are still unknown.



10. *Acranthera simalurensis* Brem. n. spec.; typus: *Achmad 141* (L).

Herba robusta sed altitudine ignota. Caulis pilis ferrugineis primum dense, deinde sparse hirsuto-strigosus, diametro ad apicem 2.5 mm., basin versus usque ad 8 mm. aucto, internodiis 1.2–5.5 cm. longis. Folia petiolo 1.5–3 cm. longo, dense hirsuto-strigoso instructa; lamina lanceolata vel oblanceolata, 11–18 cm. longa et 4–7.5 cm. lata, breviter vel longius acuminata, basi acuta vel cuneata, margine pilis brevibus strigosa, subtus costa nervisque pilis stramineis dense, inter nervos sparse strigosa, utrimque opaca, sicc. supra olivaceo-brunnea vel nigrescens, subtus fusca, nervis utroque latere costae 10 vel 11. Stipulae 7–10 mm. longae et 5–7 mm. latae, apice colletris pluribus instructae, costa praesertim apicem versus hirsuto-strigosa. Inflorescentiae basi foliis rudimentariis 3 mm. longis instructae, 1- usque ad 3-florae; bracteae florum lateralium lanceolatae, 5 mm. longae. Flores nondum visi. Fructus pedicello strigoso, 5 mm. longo elatus, 3 cm. longus et 2.5 mm. diam., strigosus, calycis lobis linearilanceolatis, 12 mm. longis et 2.5 mm. latis, acutis coronatus, pericarpio tenui.

Habitat insulam a Sumatra ad occasum Simalur dictam.

SIMALUR: s.l., *Achmad 141* (L, typus).

Vernacular name: gulamang gadjah.

Valeton had recognized in Achmad's specimen a new *Acranthera* species, for which he proposed the specific epithet "*mutica*," but a description was never published. The name "*mutica*" has probably been used in opposition to "*Acranthera*," and would mean that the anthers are blunt, but as this can hardly be right, I have chosen another epithet. If the name really referred to the shape of the anthers, it would prove that Valeton had seen flowers, which in the Leiden specimens were not present; the Buitenzorg material, therefore, would be more complete.

#### SUBGENUS E. PHANEROCHITON BREM. SUBGEN. NOV.

Herba robusta, suberecta. Folia supra cellulis resiniferis sicc. sub lente nigro-punctata, laxe reticulata. Stipulae oblongae, apice acuto longe apiculatae, maximae, extus bis inde colletris instructae, laxe reticulatae. Inflorescentia terminalis, nunc trichotome corymbosa et subsessilis, nunc ramulis lateralibus suppressis longius pedunculata; ramuli posteriores bracteis magnis imbricatis instructi. Corolla rubella, tubo infundibuliformi. Stamina filamentis quam antheris multo brevioribus, antheris connectivo carinato, granulato et ciliolato. Discus inconspicuus. Receptaculum pollinis thecis paulo brevius, fusiforme. Fructus ovoideus, pericarpio et dissepimento crassis. Semina reticulata.

Subgenus adhuc monotypicum terrae Borneënsis partem occidentalem habitans. Subgeneris typus: *A. involucrata* Val.

11. *Acranthera involucrata* Val. in Ic. Bog. 4: 279, t. 393. 1914.

Herba robusta sed altitudine ignota. Caulis dense velutino-hirsutus, diametro 6–9 mm., internodiis 1.5–5 cm. longis, inferioribus tamen non visis. Folia petiolo 2–4 cm. longo, dense velutino-hirsuto instructa; lamina obovata, 12.5–35 cm. longa et 5.2–12 cm. lata, apice caudato-acuminata,

basi sensim in petiolum contracta, margine primum dense, deinde sparsius velutino-hirsuta, supra costa per totam longitudinem velutino-hirsuta excepta glaberrima, subtus costa nervisque densissime velutino-hirsuta, venulis sparsius velutinis, inter venulos primum dense, deinde sparse villosa, supra nitidula, sicc. supra saturate rubro-brunnea, subtus fusca, nervis utroque latere costae 12–20. Stipulae usque ad 6.5 cm. longae et 1.7 cm. latae, basi circ. 1 cm. connatae, extus costa prominente sicut margine dense velutino-hirsutae, ceterum sparse villosae, scariosae, sicc. brunneae, persistentes. Inflorescentiae ramuli primarii et rachis aut, si ramuli suppressi, pseudo-pedunculus 3–5 cm. longi, dense velutino-hirsuti; ramuli alii breves et flores igitur sub bracteis magnis latentes; bractee ramulorum primariorum deciduae, nondum visae, ramulorum secundariorum ovatae, 3.5 cm. longae et 2.5 cm. latae, aliae gradatim minores et praesertim angustiores, dense imbricatae, minime usque ad anthesin persistentes; omnes ubique sed praesertim margine et costa pubescentes. Flores pedicellati. Pedicellus 5 mm. longus, dense velutinus. Ovarium breviter cylindricum, 6 mm. longum et 2 mm. diam., dense velutinum. Calycis lobi oblanceolati, 10 mm. longi et 3.5–4 mm. lati, acuti, extus intusque sparse, margine et costa densius pubescentes. Corolla (forsitan nondum plene matura) 11 mm. longa, extus sparse, margine densius villosa; tubus 6 mm. longus et ad orem 7 mm. diam.; lobi ovati, 5 mm. longi et basi 4.5 mm. lati, acuti. Stamina 8.5 mm. longa; filamenta 1.5 mm.; antherae 7 mm. longae, connectivo in appendicem vix 0.5 mm. longam producto. Stylus apice conica vix divisus. Fructus circ. 10 mm. diam.

Habitat terrae Borneënsis partem occidentalem.

'SARAWAK: near Kuching, *Haviland & Hose*, 8. IX. 1892 (AA); *Haviland*, 15. IX. 1892; s.l., *nat. coll.* 2018 (AA). BORNEO: Western Division: Upper Kapuas Mts., base of G. Damus, *Hallier* 486 (L).

This species is, apart from the much denser indumentum and the persistent bracts, habitually not unlike *A. frutescens* Val., from which it differs, however, in the following important points: the presence of resin-cells in the epidermis of the upper side of the leaf, the infundibuliform corolla-tube, the greater length and fusiform shape of the *receptaculum pollinis*, and the thick-walled fruit. The thick dissepiment distinguishes this plant from all other species of this genus of which the fruits are known. The wide range of variability in the number of nerve pairs is rather remarkable: it may be observed even in one and the same specimen.

#### SUBGENUS F. DICHROANTHES BREM. SUBGEN. NOV.

Herbae humiles, ascendentes vel subrosulares. Folia laxè reticulata. Stipulae oblongae, lanceolato-oblongae, ellipticae vel ovatae, internodiis longiores, extus hic inde colletris sparsae, laxè reticulatae. Inflorescentiae nunc terminales, nunc brachyblastos oppositos, basi foliis rudimentariis instructos terminantes, umbelliformes vel ad florem singulum redactae. Calycis lobi interdum colorati. Corolla, ubi color notus, rubra, aurantiaca vel lutea, tubo infundibuliformi vel anguste campanulato. Stamina filamentis glabris et liberis, quam antherae nunc paulo brevioribus, nunc paulo longioribus, antheris connectivo nunc carinato, nunc convexo, sed semper minime basi ciliolato, in appendicem brevem producto. Discus



inconspicuous. *Receptaculum pollinis* thecis paulo brevius, vix incrassatum. Fructus adhuc imperfecte notus, probabiliter cylindricus, 6-costatus.

Species adhuc notae duodecim terram Borneënsem habitantes. Subgeneris typus: *A. salmonea* Brem. n. spec. v. infra.

#### KEY TO THE SPECIES

Inflorescence at the end of the stem. Stigmata cohering.....Series a. **Sympodiales**  
Calyx-lobes 17–18 mm. long. Corolla-tube infundibuliform. Connective carinate and granulate.

Leaves bullate and provided with 13–15 pairs of nerves. Inflorescence with several flowers: Calyx and corolla both red.— West Borneo.....12. *A. bullata*

Leaves without blisters and provided with 6–8 pairs of nerves only. Inflorescence with 1 or 2 flowers only.

Leaves mostly less than 13 cm. long and 5 cm. wide, entirely glabrous above.

Bracts 7 mm. long. Pedicel up to 10 mm. long.— West Borneo.....13. *A. Johannis-Winkleri*

Leaves mostly more than 13 cm. long and 5 cm. wide; midrib on the upper side strigose. Bracts 2–3 mm. long. Pedicel more than 2 cm. long.—

North ? Borneo.....14. *A. monantha*

Calyx-lobes 10–12 mm. long. Corolla-tube narrowly campanulate. Connective neither carinate nor granulate.

Leaves variegated, entirely glabrous on the upper side. Inflorescence with 6–12 flowers. Corolla sulphur-yellow. Anthers 6.5 mm. long.— West Borneo.....15. *A. variegata*

Leaves entirely green, with a few long appressed hairs on the upper side. Inflorescence with 4–6 flowers. Corolla orange. Anthers 11 mm. long.—

West Borneo.....16. *A. aurantiaca*

Inflorescences at the end of opposite brachyblasts provided with a pair of rudimentary leaves. Stigmata free.....Series b. **Monopodiales**

Inflorescence umbelliform.

Leaves less than 20 cm. long and provided with 5–8 pairs of nerves. Calyx-lobes 12 mm. long.— East Borneo.....17. *A. salmonea*

Leaves about 30 cm. long and provided with 13 pairs of nerves. Calyx-lobes 20 mm. long.— Borneo.....18. *A. megaphylla*

Inflorescence usually reduced to a single flower.

Leaves with about 10 pairs of nerves. Stipules more than 3 cm. long.— West Borneo.....19. *A. longipetiolata*

Leaves with less than 10 pairs of nerves. Stipules less than 2.5 cm. long.

Calyx-lobes ovate-lanceolate.

Midrib and nerves on the underside densely white-pubescent.— South-east Borneo.....20. *A. axilliflora*

Midrib and nerves on the underside densely ferrugineous-pubescent.— West Borneo.....21. *A. abbreviata*

Calyx-lobes linear-lanceolate or narrowly triangular.

Leaves entirely green, provided with about 8 pairs of nerves. Stipules 5–12 mm. long. Corolla 2–2.5 cm. long.— Central Borneo.....22. *A. hirtistipula*

Leaves variegated, provided with 4–5 pairs of nerves. Stipules 12–20 mm. long. Corolla 3–4.5 cm. long.— Central Borneo.....23. *A. maculata*

.....23. *A. maculata*

#### SERIES A. SYMPODIALES

Inflorescentiae caulem terminantes. Stigmata cohaerentia.— Species 12–16.

12. *Acranthera bullata* Merr. in Mitt. Inst. Allg. Bot. Hamburg 7: 284. 1937.

Herba ascendens, circ. 12 cm. alta, interdum pseudo-dichotome rami-  
ficata. Caulis primum pilis curvis breviter et parce substrigosus, deinde  
glabrescens, diametro ad apicem 5 mm., basin versus usque ad 7 mm.  
aucto, internodiis raro plus quam 1 cm. longis. Folia petiolo 1–4 cm.  
longo, pilis curvis breviter fulvo-strigoso instructa; lamina obovata, 11–18  
cm. longa et 6–9 cm. lata, apice breviter acuminata, basi plerumque sub-  
truncata sed prope petiolum subito contracta, interdum tamen acuta,  
margine pilis pro parte longioribus primum albidis, deinde fulvis, primum  
dense, deinde sparsius substrigosa, supra glaberrima, subtus costa nervis  
venulis pilis brevibus curvis fulvis dense substrigosa, utrumque opaca,  
supra vivo olivacea, sicc. olivaceo-brunnea, subtus vivo laete rubra, sicc.  
fuscens, inter venulos principales conspicue bullata, nervis utroque  
latere costae 13–15, venulis principalibus nervos transverse connectentibus,  
remotioribus, aliis paucis et vix conspicuis. Stipulae ellipticae, 1.5–2.5  
cm. longae et 1.2–2 cm. latae, acutae vel subacutae, sed costa semper in  
mucronem satis longam producta, extus sparse et breviter strigosae, costa  
prominente, subpatentes, persistentes. Inflorescentia subsessilis, umbelli-  
formis, multiflora; bractae lineares, 6 mm. longae et 0.7 mm. latae,  
margine densius, alibi pilis brevibus parce strigosae. Flores pedicello pilis  
brevissimis dense griseo-strigoso, usque ad 10 mm. longo instructi.  
Ovarium cylindricum, 10 mm. longum et 0.8 mm. diam., ut pedicellus  
dense griseo-strigosum. Calycis lobi rubri, lanceolati, 18 mm. longi et  
4.5–6 mm. lati, acuti, margine densius, ceterum extus intusque sparse  
puberulo-strigosi, 7-nervi. Corolla rubra, 2.9 cm. longa, margine dense,  
ceterum extus sparse puberulo-strigosa; tubus infundibuliformis, 1.7 cm.  
longus et ad orem 1.0 cm. diam.; lobi ovato-triangulares 9 mm. longi et  
basi 5.5 mm. lati. Stamina 1.8 cm. longa; filamenta 8 mm.; antherae 10  
mm. longae, connectivo carinato et granulato in appendicem circ. 0.5 mm.  
longam producto. Fructus nondum notus.

Habitat terrae Bornëensis partem occidentalem.

BORNEO: Western Division: Sintang, S. Malang, 113° 20' E.long., 1° N.lat., alt.  
70 m., *Winkler 1298* (HBG, typus); ibidem, S. Gulu, 112° 25' E.long., 0° 16' N.lat.,  
alt. 150 m., *id. 181* (HBG), n.v.

A specimen collected by the Expedition *Nieuwenhuis* near the S. Blu-u  
(541 [L], *A. multinervia* Val. in sched.) comes very near to the plant  
described above, and may be conspecific. Its leaves, however, are less  
distinctly bullate, the hairs on the nerves are more patent, and the pedicels  
and ovaries less densely grey-strigose; that the thecae seem to be less  
distinctly ciliate and the connective but indistinctly granulate, may be  
due to the immaturity of the buds and their bad state of preservation.

The inflorescence of *A. bullata* has three main branches, but the latter  
are so short that their existence is easily overlooked. From a morphologi-  
cal point of view their presence, nevertheless, is of importance, because it  
shows that the umbelliform inflorescence of this subgenus is to be derived  
from the trichotomously corymbose one found in several other subgenera.

*Acranthera bullata* is easily distinguishable by its bullate leaves. It  
comes nearest to *A. Johannis-Winkleri* Merr. and *A. monantha* Val., which  
it resembles in the great length of the calyx-lobes and the infundibuliform



corolla, but from which it differs in the many-nerved leaves and the several-flowered inflorescences.

13. *Acranthera Johannis-Winkleri* Merr. in Mitt. Inst. Allg. Bot. Hamburg 7: 285. 1937.

Herba ascendens, usque ad 25 cm. alta, ad anthesin interdum decumbens et e basi enovationes emittens. Caulis primum villosus, deinde glabrescens, diametro ad apicem 2 mm., basin versus usque ad 4 mm. aucto, internodiis 0.5–2.5 cm. longis. Folia petiolo 1–4 cm. longo, primum dense, deinde sparse villosa instructa; lamina elliptica vel obovata, 4–13.5 cm. longa et 1.8–5.2 cm. lata, apice subacuminata, basi cuneata, margine pilis stramineis longis primum dense, deinde sparsius substrigosa, supra glaberrima, subtus sparse sed costa nervisque densius villosa, utrimque opaca, supra sicc. olivacea, subtus fusca, nervis utroque latere costae 6 vel 7. Stipulae oblongae, 1–2 cm. longae et 3–7 mm. latae, obtusae vel acutae sed semper mucronatae, extus sparse villosae, costa prominula, ante folia deciduae. Inflorescentia subsessilis, 1- vel 2-flora, mox a ramulo axillari in positionem lateralem coacta; bractae oblongae, 7 mm. longae et 3 mm. latae. Flores pedicello densius griseo-villoso, usque ad 10 mm. longo elati. Ovarium rubellum, cylindricum, 9 mm. longum et 0.7 mm. diam., densius griseo-villosum. Calycis lobi laete virides, lanceolati, 17 mm. longi et 3.5–4 mm. lati, acuti, extus intusque sparse, margine densius pubescentes, 7-nervi, nervis lateralibus a venulis interdum vix distinguendis. Corolla aurantiaca, 3.7 cm. longa, 5- vel 6-mera, extus praesertim basin versus pilis brevibus pubescens; tubus infundibuliformis, 2 cm. longus et ad orem 1 cm. diam.; lobi triangulares 17 mm. longi et basi 6 mm. lati. Stamina 1.7 cm. longa; filamenta 7.5 mm.; antherae 9.5 mm. longae, connectivo carinato et granulato in appendicem circ. 0.5 mm. longam producto. Fructus cylindricus, nondum plene maturus 16 mm. longus et 2.5 mm. diam., 6-costatus, sparse griseo-pubescent.

Habitat terrae Borneënsis partem occidentalem.

BORNEO: Western Division: Sintang, S. Raun, 113° 15' E.long., 0° 40' N.lat., alt. 200 m., *Winkler 1559* (HBG, typus); S.Obat, 113° 20' E.long., 0° 55' N.lat., alt. 80 m., *id. 1389* (HBG) n.v.

If we may assume that the form and structure of the fruit of this species is typical for the whole subgenus, the difference between the latter and the subgenus *Phanerochiton* becomes still more prominent.

*Acranthera Johannis-Winkleri* resembles *A. bullata* in the long calyx-lobes, the infundibuliform corolla-tube and the carinate and granulate connective, but is easily distinguishable by the smooth leaves, the smaller stipules, 1- or 2-flowered inflorescence, the greenish colour of the calyx-lobes and the orange colour of the corolla, and the greater length of the latter's lobes. *Acranthera monantha* Val. is probably even more closely allied, but comparison is made difficult by the circumstance that we have no information with regard to the connective and with regard to the colour of calyx and corolla. On account of the very close resemblance in other respects, the connective will probably prove to be carinate and granulate; in the key to the species use has already been made of this character.

From *A. variegata* Merr. and *A. aurantiaca* Val. ex Brem. both *A.*

*Johannis-Winkleri* and *A. bullata* differ in the shape of the corolla-tube, the greater length of the calyx-lobes, the longer filaments and the distinctly carinate and granulate connective.

14. *Acranthera monantha* Val. in Bot. Jahrb. 48: 111. 1912. — North ? Borneo.

Of this species I have seen no specimens, but judging from the description there can be little doubt that it is nearly related to *A. Johannis-Winkleri* Merr. No information, however, is available with regard to the flower-colour, the shape of the connective and that of the *receptaculum pollinis*. The plant, moreover, is described as unisexual, but this is doubtless a mistake. The type, *Beccari 3154*, was, according to Valetton l.c., collected in North Borneo, but as some other specimens whose numbers differ but slightly from that of this plant, are known to have been collected in Sarawak, I suppose that this is a mistake.

15. *Acranthera variegata* Merr. in Mitt. Inst. Allg. Bot. Hamburg 7: 285. 1937.

Herba subrosularis. Caulis ad apicem pilis brevibus satis dense griseo-strigosus, basin versus plus minusve glabrescens, diametro ad apicem 1.2 mm., basin versus usque ad 4 mm. aucto, internodiis 5–10 mm. longis. Folia petiolo 0.4–2 cm. longo, pilis brevibus satis dense griseo- vel fulvo-strigoso instructa; lamina obovata, 7–16 cm. longa et 3–6.7 cm. lata, apice breviter acuminata, basi acuta vel saepius subtruncata et prope petiolum subito contracta, margine dense fulvo-strigosa, supra glaberrima, subtus costa nervisque pilis brevibus dense fulvo-strigosa, venulis pilis brevibus minus dense strigosis, utrimque opaca, maculis irregularibus albo-variegata, sicc. supra olivacea, subtus fusca, nervis utroque latere costae 4 vel 5. Stipulae ovato-oblongae, circ. 1 cm. longae et 4 mm. latae, subcutae, extus sparse strigosae, costa prominente, subpersistentes. Inflorescentia subsessilis, umbelliformis, floribus 6–12; bractae lineari-filiformes, circ. 4 mm. longae. Flores pedicello pilis brevissimis dense griseo-strigoso usque ad 1.5 cm. longo elati. Ovarium cylindricum, 5 mm. longum et 0.8 mm. diam., ut pedicellus dense griseo-strigosum. Calycis lobi laete virides, lanceolati, 10 mm. longi et 1.8–2.2 mm. lati, acuti, extus costa et margine pilis brevibus densius, ceterum sparse strigosi, 5-nervi. Corolla laete sulphurea, 18.5 mm. longa, margine densius, ceterum extus sparse et brevissime griseo-strigosa; tubus anguste campanulatus, 10 mm. longus et 4 mm. diam.; lobi oblongi, 8.5 mm. longi et 2.5 mm. lati. Stamina 8.5 mm. longa; filamenta 2 mm.; antherae 6.5 mm. longae, thecis basi solum ciliolatis, connectivo nec granulato nec carinato in appendicem vix conspicuam producto. Fructum nondum vidi; fide *Merrill* l.c. subteres vel rotundato-angulatus, 1 cm. longus et 2–2.5 mm. diam.

Habitat terrae Borneënsis partem occidentalem.

BORNEO: Western Division: Sintang, S. Malang, 113° 20' E.long., 1° N.lat., *Winkler 1294* (HBG, typus).

So far three species of *Acranthera* are known to be provided with variegated leaves. The two others are: *A. maculata* Val. and *A. Hallierii* Val. *Acranthera maculata* also belongs to the subgenus *Dichroanthes*, but to the series Monopodiales; it is moreover easily distinguishable from *A. variegata* by its solitary flowers. *Acranthera Hallierii* has a mitriform *receptaculum pollinis*, and belongs therefore to the subgenus *Mitracme*.



It differs further from *A. variegata* in the presence of 6-7 pairs of nerves in the leaves, the deciduous stipules, and the position of the inflorescences, which are not found at the end of the stem, but at the end of opposite brachyblasts.

The nearest ally of this species is doubtless *A. aurantiaca* Val. ex Brem., whose leaves are longer and narrower, on the upper side strewn with a few hairs, and entirely green, and whose inflorescences consist of fewer but larger flowers.

A peculiarity of *A. variegata* not mentioned in the description, is the presence of a ring of cohering colleters on the inside of the calyx; it is produced in triangular slips between the calyx-lobes. In all other species the number of colleters is so much smaller that they are unable to form a complete ring; sometimes, however, they cohere in groups, especially in the gaps between the calyx-lobes.

16. *Acranthera aurantiaca* Val. in sched.; typus: *Teysmann H.B. 8031* (L).

Herba subrosularis. Caulis ad apicem satis dense griseo-strigosus, basin versus plus minusve glabrescens, diametro ad apicem 2.5 mm., basin versus usque ad 5 mm. aucto, internodiis 5-10 mm. longis. Folia petiolo 0.5-2.5 cm. longo, satis dense fulvo-strigoso instructa; lamina obovata vel saepius oblanceolata, 9-16 cm. longa et 4-5 cm. lata, apice acuta vel subacuminata, basi acuta vel cuneata, margine densius strigosa, supra pilis perpaucis sed satis longis strigosa, subtus costa nervisque dense, venulis sparsius fulvo-strigosa, utrimque opaca, haud variegata, sicc. supra olivacea, subtus fusca, nervis utroque latere costae 5 vel 6. Stipulae ovatae, circ. 1 cm. longae et 8 mm. latae, subacutae, extus sparse strigosae, costa prominula, subpersistentes. Inflorescentia subsessilis, umbelliformis, floribus 4-6; bractae lineares, circ. 5 mm. longae. Flores pedicello pilis brevibus dense griseo-strigoso, usque ad 1.5 cm. longo elati. Ovarium cylindricum, 5 mm. longum et 1 mm. diam., ut pedicellus dense griseo-strigosum. Calycis lobi lineares, 12 mm. longi et 1.8-2.2 mm. lati, acuti, margine et costa pilis brevibus densius, ceterum utrimque sparse strigosi, 3- vel 5-nervii. Corolla aurantiaca, in exemplo solo praeservato apice ab insectis destructa, extus pilis brevibus sparse strigosa; tubus anguste campanulatus minime 15 mm. longus et 4 mm. diam. Stamina 16 mm. longa; filamenta 5 mm.; antherae 11 mm. longae, thecis basi solum et vix conspicue ciliolatis, connectivo nec carinato nec granulato in appendicem brevissimam producto. Fructus nondum notus.

Habitat terrae Borneënsis partem occidentalem.

BORNEO: Western Division: Singkawang, Passi (circ. 109° E.long., 1° N.lat.), *Teysmann H.B. 8031* (L, typus).

The differences between this species and the preceding one have been summarized in the note attached to the latter.

#### SERIES B. MONOPODIALES

Inflorescentiae brachyblastos oppositos, uno jugo foliorum rudimentariorum instructos terminantes. Stigmata libera, subulata. — Species 17-23.

17. *Acranthera salmonea* Brem. n. spec.; typus: *Rutten 119* (U).

Herba ascendens, circ. 30 cm. alta. Caulis primum pilis fulvis breviter substrigosus, deinde plus minusve glabrescens, diametro ad apicem 2.5 mm., basin versus usque ad 4 mm. aucto, internodiis 2.2–6.5 cm. longis. Folia petiolo 2.5–4.5 cm. longo, pilis brevibus fulvis primum dense, deinde sparsius substrigoso instructa; lamina obovata, 10.5–17 cm. longa et 4.2–6.2 cm. lata, apice acuta vel breviter acuminata, basi cuneata, margine primum densissime, deinde minus dense strigosa, supra glaberrima, subtus costa nervisque pilis longioribus densissime fulvo-strigosa, venulis pilis brevibus densissime, inter venulos sparse strigosa, utrumque opaca, sicc. supra olivaceo-brunnea vel subnigra, subtus fusca, nervis utroque latere costae 5–8. Stipulae oblongae vel ovato-oblongae, 2.2 cm. longae et 8–13 mm. latae, subacutae, extus sparse, margine densius strigosae, costa basin versus prominula, ante folia deciduae. Inflorescentiae basi foliis duobus ovatis, 15 mm. longis et 7.5 mm. latis instructae, sessiles, umbelliformes, 5-usque ad 9-florae; bracteae lineari-lanceolatae, 5 mm. longae et 1 mm. latae. Flores pedicello pilis brevibus densius griseo-strigoso, usque ad 1.5 cm. longo elati. Ovarium cylindricum, 12 mm. longum et 1 mm. diam., ut pedicellus dense griseo-strigosum. Calycis lobi lineari-lanceolati vel lanceolati, 12 mm. longi et 2.5–5 mm. lati, acuti et mucronati, rubri, utrumque pilis brevissimis sparse, margine densius strigosi, 5-nervi. Corolla salmonea, 3 cm. longa, extus pilis brevissimis sparse, margine densius strigosa; tubus anguste campanulatus, 2.5 cm. longus et 8 mm. diam.; lobi ovati, 5.5 mm. longi latique, acuti. Stamina 2.2 cm. longa; filamenta 13 mm.; antherae 9 mm. longae, connectivo carinato et granulato, basin versus valde gibboso, apice in appendicem crassiusculam, vix 0.5 mm. longam producto. Receptaculum pollinis squamis fungiformibus obtectum. Fructus nondum notus.

Habitat terrae Borneënsis partem orientalem.

BORNEO: Southern and Eastern Division: Samarinda, above Pamaluan, 116° E. long., 1° S. lat., *Rutten 119* (U, typus), "on the river bank in primary forest": the lower part of the stem and the lower leaves of his specimen indeed are covered with mud.

The papillae by which the *receptaculum pollinis* of this and the two next species is covered, are somewhat different from those of the species previously dealt with: they are united to fungiform scales, i.e. at the base they form a rather thick stipe and spread at the top. In the species 20–23 their structure is unknown; Valeton's fig. 7 on t. 395 of Ic. Bog. 4: suggests that they may be of a similar nature in *A. maculata*.

*Acranthera salmonea* resembles the next species, *A. megaphylla* Brem., in the umbelliform inflorescence, but is easily distinguishable by the smaller size of the leaves and stipules and by the shorter calyx-lobes.

18. *Acranthera megaphylla* Brem. n. spec.; typus: *Coll. ign. H.B. 409* (L).

Probabiliter planta ascendens. Caulis glaber, diametro ad apicem 8 mm., basin versus aucto, internodiis paucis preservatis circ. 1 cm. longis. Folia petiolo 12–12.5 cm. longo, breviter et sparse strigoso instructa; lamina obovata, circ. 30 cm. longa et 12 cm. lata, apice caudato-acuminata, basi acuta vel subcontracta, margine satis dense sed vix conspicue strigosa.

supra costa quae basin versus est breviter et satis dense strigosa excepta glaberrima, subtus costa nervisque pilis brevibus densissime fulvo-strigosa, inter nervos pilis brevissimis parce strigosa, utrimque opaca, sicc. supra rubro-brunnea, subtus fusca, nervis utroque latere costae 13. Stipulae lanceolato-oblongae, 3.5–4.5 cm. longae et 10–13 mm. latae, acutae, extus pilis brevibus satis dense, margine densius strigosae, costa prominente, subpersistentes. Inflorescentiae basi foliis duobus ovato-lanceolatis, 13 mm. longis et 5.5 mm. latis instructae, sessiles, umbelliformes, 5-florae; bracteae lineari-lanceolatae, 12 mm. longae et 3 mm. latae. Flores pedicello pilis brevissimis densissime griseo-strigoso, circ. 5 mm. longo elati. Ovarium cylindricum, 10 mm. longum et 1 mm. diam., ut pedicellus densissime griseo-strigosum. Calycis lobi lineares, 20 mm. longi et 4–5 mm. lati, acuti, pilis brevissimis extus densius, intus sparsius strigosi, costa prominula, 5-nervi. Corolla colore ignoto, in exemplo examinato nondum plene matura 15 mm. longa, extus pilis brevissimis densissime strigosa; tubus anguste campanulatus 10 mm. longus et 4 mm. diam.; lobi ovati, 5 mm. longi et 4 mm. lati, acuti. Stamina filamentis nondum elongatis; antherae 10 mm. longae, connectivo carinato et granulato, basin versus gibboso, in appendicem 0.6 mm. longam producto. Receptaculum pollinis squamis fungiformibus obtectum. Fructus nondum notus.

Habitat terram Borneensem, probabiliter partem centralem.

BORNEO: s.l., *Collector ignotus* H.B. 409 (L, typus).

The Leiden herbarium received this specimen from Buitenzorg, but neither the name of the collector nor the exact locality is given. It may have been one of the plants collected by the Expedition *Nieuwenhuis*; in that case it will probably have been collected in the central part.

In its umbelliform inflorescences it resembles *A. salmonea*; in the length of the petioles, the large size of the leaf blade and the long stipules, *A. longipetiolata* Merr. ex Brem. The flower buds investigated by me, were apparently very immature: judging from the size of the anthers, I suppose that they will probably reach about the same size as those of *A. salmonea* and *A. longipetiolata*.

19. *Acranthera longipetiolata* Merr. n. nom. in sched., 7. XII. 1937.

*Acranthera longipes* Merr. in Mitt. Inst. Allg. Bot. Hamburg 7: 284. 1937, homon. illeg. nam non Merr. in Papers Mich. Acad. Sci. 19: 194. 1934 (cf. species 8).

Herba ascendens, probabiliter circ. 25 cm. alta. Caulis primum sparse et vix conspicue strigosus, deinde glabrescens, diametro ad apicem 7 mm., basin versus usque ad 12 mm. aucto, internodiis 1–2 cm. longis. Folia petiolo 6–12 cm. longo, pilis brevissimis primum dense griseo-strigoso, deinde sparsius fusco-strigoso instructa; lamina oblonga vel oblongo-obovata, 20–25 cm. longa et 9–10 cm. lata, apice acuminata, basi acuta vel saepius subobtusa sed prope petiolum subito contracta, margine dense griseo-strigosa, supra glaberrima, subtus costa nervisque pilis brevissimis densissime griseo-strigosa, inter nervos pilis brevissimis vix conspicue sed satis dense strigosa, utrimque opaca, sicc. supra saturate rubro-brunnea, subtus fusca, nervis utroque latere costae 10. Stipulae oblongae, 3.5–4.5 cm. longae et 13–16 mm. latae, obtusae, extus pilis brevibus satis dense griseo-strigosae, costa basin versus prominente, persistentes. Inflorescen-



tiae basi foliis duobus rudimentariis ovato-lanceolatis, 15 mm. longis et 6 mm. latis instructae, sessiles, uniflorae. Flos subsessilis. Ovarium cylindricum, 13 mm. longum et 1.5 mm. diam., pilis brevissimis densissime griseo-strigosum. Calycis lobi purpurei, lanceolati, 23 mm. longi et 4–6 mm. lati, acuti, extus intusque pilis brevissimis sparse, margine densius griseo-strigosi, 5-nervi. Corolla rubro-aurantiaca, 3 cm. longa, extus pilis brevissimis sparse, margine densius griseo-strigosa; tubus anguste campanulatus 24 mm. longus et 7 mm. diam.; lobi ovati, 6 mm. longi et basi 5 mm. lati, acuti. Stamina 2.2 cm. longa; filamenta 12 mm.; antherae 10 mm. longae, connectivo carinato et granulato, basin versus gibboso, apice in appendicem crassiusculam, circ. 0.5 mm. longam producto. Receptaculum pollinis squamis fungiformibus obtectum. Fructus nondum notus.

Habitat terrae Borneënsis partem occidentalem.

BORNEO: Western Division: Sintang, Upper Kapuas Mts., Bt Obat, 113° 20' E. long., 1° N. lat., alt. 150 m., *Winkler 1345* (HBG, typus).

*Acranthera longipetiolata* differs from the two preceding species in the uniflorous inflorescences, and from the other species belonging to this series in the great length of the petioles and the large size of the leaves and stipules.

An apparently nearly related species is represented by a specimen collected in Sarawak (Nat. coll. 1036 [AA]). Its leaves are much smaller (13–18 cm.  $\times$  4.5–6 cm.) attenuate at both ends, and provided with six instead of ten pairs of nerves; the petioles are shorter and very sparsely strigose, and the stipules are nearly glabrous. As flowers and fruits are wanting, it does not seem advisable to name it.

20. *Acranthera axilliflora* Val. in Bot. Jahrb. 44: 550. 1910; Val. in adnot. ad *A. maculatam* Val. in Ic. Bog. 4: 284. 1914. — South-east Borneo.

The type of this species, of which no material was available to me, was collected by Hub. Winkler between Batu Babi and Lumowia in South-east Borneo. The description is in some important points incomplete, but in a note attached to the description of *A. maculata* Val. it is stated that it agrees with the latter in the structure of its inflorescence and flowers, and that it differs from that species in the same way as *A. abbreviata* Val., viz. in the ovate-lanceolate instead of linear calyx-lobes and in the larger size of the leaves with their 6 or 7 instead of 4 or 5 pairs of nerves. Although in the description of *A. abbreviata* itself no mention is made of *A. axilliflora*, the affinity between these two species is apparently closer than that existing between *A. axilliflora* and *A. maculata*. In fact, the only difference between *A. axilliflora* and *A. abbreviata* which could be detected by a comparison of the descriptions, lies in the nature of the indumentum.

21. *Acranthera abbreviata* Val. in Ic. Bog. 4: 181. t. 355. 1913; Merr. in Mitt. Inst. Allg. Bot. Hamburg 7: 283. 1937. — West Borneo.

I found a duplicate of the type of this species in the Leiden herbarium, but as it has no flowers, it is not worthwhile describing it.

The details of the flower are badly represented in the figures accompany-

ing Valeton's description, but as the inflorescences are borne on opposite brachyblasts, the filaments long and the thecae ciliate, there can be no doubt that it belongs to this series.

The type was collected by Hallier at Liang Agang in the Müller Mts. ( $113^{\circ} 20'$  E.long.,  $0^{\circ} 40'$  N.lat.). Another specimen was found by Winkler on the Bt. Raja ( $112^{\circ} 40'$  E.long.,  $0^{\circ} 40'$  N.lat.) at an altitude of 1250 m. (cf. Merrill l.c.).

22. *Acranthera hirtistipula* Val. in Ic. Bog. 4: 277, t. 392. 1914. — Central Borneo.

Of this species too no material was available to me. Valeton l.c. states that it shows a "superficial" resemblance to *A. maculata* Val., from which it should differ in the small size and deciduousness of the stipules, the number of pairs of nerves, the larger size of the leaf-tip and the stamens. The filaments, namely, are said to be slightly shorter than the anthers, but as the figures show that the flowers investigated by Valeton were not yet fully mature, this is by no means certain. It is quite possible that in the open flower the filaments will prove to be longer. The connective is described as broad and flat, but in fig. 3 it is shown as carinate, and I have little doubt that this is right, and that the resemblance between *A. hirtistipula* and *A. maculata*, therefore, is not merely "superficial," but that the two species are nearly allied. By the aid of the characters given in the key they will, nevertheless, prove easily distinguishable.

23. *Acranthera maculata* Val. in Ic. Bog. 4: 284, t. 395. 1914. — Central Borneo.

Of this species too I have seen no material. The Buitenzorg herbarium apparently possesses a large number of specimens, all collected during the Expedition Nieuwenhuis in Central Borneo. Of one of the specimens the flowers are said to be white, but the colour of the others is not mentioned. The white colour; however, may be a mistake. Figure 8 represents a fruit which is said to belong to this species, but this apparently is wrong, for it is more or less rostrate and lacks the persistent calyx: it might pertain to a *Cyrtandra*. It is possible, therefore, that one of Valeton's specimens was mis-identified, and the white flowers might belong to this one.

Valeton's figure gives the impression that the uppermost flower is terminal, and the others solitary at the nodes; if this were so, this species could not belong to the series Monopodiales. As the description, however, makes no mention of a terminal flower, and as the bifid stigma points in the direction of the species with opposite inflorescences, the impression created by the figure is probably wrong.

SUBGENUS G. ABLEPHARIDESMA BREM. SUBGEN. NOV.

Herbae ascendentes. Caulis pro genere tenuis. Folia pro genere parva, supra glaberrima, paucinervia, venulis paucis laxè reticulatis. Stipulae oblongae, apice acutae, costa prominente, usque ad 1 cm. longae. Inflorescentiae brachyblastos oppositos, foliis rudimentariis munitos ter-

minantes, subsessiles, uniflorae. Flos 4- vel 5-merus, subsessilis. Corolla in specie ubi color notus albida, tubo anguste campanulato. Stamina filamentis glabris et liberis, quam antheris multo brevioribus, antheris haud ciliolatis, connectivo haud carinato, in appendicem brevem producto. Discus inconspicuus. Receptaculum pollinis thecis subaequilongum, fusi-forme; stigmata brevia. Fructus cylindricus, fortiter 5- vel 6-costatus. Semina carunculata.

Species adhuc notae duae terram Borneënsē habitantes. Subgeneris typus: *A. Endertii* Brem. n. spec. v. infra.

#### KEY TO THE SPECIES

Shoots, petioles and underside of the leaves pubescent. Leaves mostly obovate and shortly acuminate. Stipules more or less persistent. Flowers 5-merous. Corolla 17 mm. long. — East Borneo.....24. *A. Endertii*  
Shoots, petioles and underside of the leaves strigose. Leaves lanceolate-elliptic, caudate-acuminate. Stipules early deciduous. Flowers 4-merous. Corolla 12 mm. long. — West Borneo.....25. *A. parviflora*

24. *Acranthera Endertii* Brem. n. spec.; typus: *Endert 2605* (BZ).

Herba ascendens, 13–20 cm. alta. Caulis primum pilis fulvis, satis longis dense hirtopubescent, deinde plus minusve glabrescent, diametro ad apicem 2 mm., basin versus usque ad 4 mm. aucto, internodiis 0.6–2 cm. longis. Folia petiolo 1.2–3 cm. longo, pilis fulvis dense hirtopubescente instructa; lamina plerumque obovata, foliorum aliquorum tamen oblonga vel lanceolato-elliptica, 5–10.5 cm. longa et 2.8–5 cm. lata, apice breviter acuminata, basi acuta vel prope petiolum subito contracta, margine dense ciliata, subtus costa nervisque pilis fulvis dense hirtopubescent, venulis principalibus pilis brevioribus dense obiectis, inter venulos primum sparse pubescens, utrimque opaca, sicc. supra olivacea, subtus dilute viridis, nervis utroque latere costae 3 vel 4. Stipulae 6–10 mm. longae et 3.5–4.5 mm. latae, apice et costa hic inde colletris longis sparsae, ubique dense sed costa densissime strigosae, subpersistentes. Inflorescentiae basi foliis duobus ovatis, 3 mm. longis instructae; bractae duae lineares, vix 2 mm. longae. Flos subsessilis, 5-merus. Ovarium cylindricum, 5.5 mm. longum et 1 mm. diam., breviter sed densissime griseo-strigosum. Calycis lobi lineares, 8 mm. longi et 0.6–0.9 mm. lati, acuti, extus intusque pilis brevissimis dense, margine et costa densissime griseo-strigosi, 3-nervi. Corolla albida, 17 mm. longa, extus pilis brevissimis dense strigosa; tubus 12 mm. longus et 3.5 mm. diam.; lobi ovati, 5 mm. longi et 3.5 mm. lati, acuti. Stamina 8 mm. longa; filamenta 2.5 mm.; antherae 6.5 mm. longae. Fructus 2.5 cm. longus et 3 mm. diam., pilis brevibus sparse strigosus.

Habitat terrae Borneënsis partem orientalem.

BORNEO: Eastern and Southern Division: Samarinda, West Kutai, H. Ibut, alt. 130 m., *Endert 2604* (BZ, typus).

The points of resemblance between this species and *A. parviflora* Val. are sufficiently expressed in the description of the subgenus, the points of difference in the key to the species.

25. *Acranthera parviflora* Val. in Ic. Bog. 4: 289, t. 398. 1914; Merr. in Mitt. Inst. Allg. Bot. Hamburg 7: 283. 1937.



Herba ascendens, 25–50 cm. alta. Caulis primum pilis brevissimis dense fulvo-strigosus, deinde plus minusve glabrescens, diametro ad apicem 1.5 mm., basin versus usque ad 4 mm. aucto, internodiis 0.8–5 cm. longis. Folia petiolo 1.5–3 cm. longo, pilis brevissimis strigoso instructa; lamina lanceolato-elliptica, 6.5–9 cm. longa et 2.5–3.8 cm. lata, apice caudato-acuminata, basi acuta, margine pilis brevibus satis dense substrigosa, subtus primum praesertim costa nervisque densissime albido-strigosa, deinde costa nervisque densius, inter nervos ubique sparse et pilorum brevitate et colore fusco vix conspicue strigosa, utrimque opaca, sicc. supra saturate olivaceo-brunnea, subtus brunnea, nervis utroque latere costae 4 vel 5. Stipulae 9–11 mm. longae et 3 mm. latae, in colletrum satis longum exeuns, extus sparse et breviter strigosae, mox deciduae. Inflorescentiae basi foliis duobus ovatis, 2.5 mm. longis instructae; bractee filiformes breviores vel nullae. Flos subsessilis, 4-merus. Ovarium cylindricum, 4 mm. longum et 0.8 mm. diam., breviter sed dense griseo-strigosum. Calycis lobi lineares, 7–9 mm. longi et 1.2–1.5 mm. lati, acuti, pilis brevibus utrimque sed extus densius griseo-strigosi. Corolla colore ignoto, 1.2 cm. longa, extus breviter sed densissime griseo-strigosa; tubus 7 mm. longus et 3 mm. diam.; lobi ovati, 5 mm. longi et 3.5 mm. lati, acuti. Stamina 6 mm. longa; filamenta 1 mm.; antherae 5 mm. longae. Fructus forsitan nondum plene maturus fide Valetton 1.5–2 cm. longus et 2–2.5 mm. diam., dense sed breviter strigosus.

Habitat terrae Borneënsis partem occidentalem.

BORNEO: Western Division: Sintang, Amai Ambit, *Hallier 3247 b* (L, dupl. typi); Liang Agang, 113° 20' E.long., 0° 40' N.lat., *id. 2817 b*, n.v.; Bt. Tilung, 113° 20' E.long., 0° 45' N.lat., alt. 800 m., *Winkler 1469* (HBG), n.v.

#### SUBGENUS H. MITRACME BREM. SUBGEN. NOV.

Herbae subrosulares, ascendentes vel suberectae. Folia laxe reticulatae. Stipulae ovatae vel oblongae, apice plerumque obtusae, internodiis plurimis longiores, extus plerumque hic inde colletris instructae, reticulatae. Inflorescentia terminalis, nunc bis vel semel trichotoma, floribus ad apices ramulorum fasciculatis, nunc umbelliformis. Corolla alba vel dilute tincta, tubo anguste campanulato. Stamina filamentis glabris et liberis, quam antheris multo brevioribus, antheris connectivo nunc ciliolato nunc eciliolato, haud carinato, in appendicem plerumque brevem producto. Discus inconspicuus. Stylus cylindricus; receptaculum pollinis thecis multo brevius, mitriforme. Fructus cylindricus. Semina reticulata vel carunculata.

Species adhuc notae septem terram Borneënsis et insulam Filipinam Mindanao dictam habitantes. Subgeneris typus: *A. velutinervia* Brem. n. spec. v. infra.

#### KEY TO THE SPECIES

Connective ciliolate. Large plants with twice trichotomous inflorescences provided with large bracts.....Series a. *Ciliolatae*

Leaves 14–20 cm. long, provided with 6 or 7 pairs of nerves; midrib and nerves on the underside velutinous. Calyx-lobes lanceolate-oblong, 13 mm. long. Fruit 3 cm. long and 1.8 mm. diam. — North Borneo.....26. *A. velutinervia*

Leaves 30–35 cm. long, provided with 11 or 12 pairs of nerves; midrib and nerves

on the underside villous or slightly hirsute. Calyx-lobes ovate, 6 mm. long. Fruit 1 cm. long and 4.5 mm. diam. — Widespread in Borneo, but not in the northern part.....27. *A. frutescens*  
 Connective eciliolate. Low plants with trichotomous or umbelliform inflorescences; bracts, except in *A. philippinensis*, small.

Inflorescences trichotomous. Leaves with 7–11 pairs of nerves.

Leaves obovate, velutinous on the upper side at least at first, on the underside on midrib and nerves persistently. Stipules neither scarious nor early deciduous.....Series b. *Philippinenses*

One species only. — Mindanao.....28. *A. philippinensis*

Leaves lanceolate, on the upper side entirely glabrous, strigose on the underside on midrib and nerves. Stipules scarious and early deciduous.....

.....Series c. *Iteophyllae*

One species only. — Central and West Borneo.....29. *A. lanceolata*

Inflorescences umbelliform. Leaves with 5–8 pairs of nerves.....

.....Series d. *Umbelliflorae*

Midrib strigose towards the leaf-base on the upper side. Calyx-lobes linear or lanceolate.

Leaves lanceolate, entirely green. Stipules oblong and acute. — Central Borneo.....30. *A. Nieuwenhuisii*

Leaves lanceolate-elliptic or obovate, variegated. Stipules ovate and obtuse. — Central Borneo.....31. *A. Hallierii*

Leaves entirely glabrous on the upper side. Calyx-lobes ovate-lanceolate. — North Borneo.....32. *A. atropella*

#### SERIES A. CILIOLATAE

Herbae robustiores. Inflorescentia bis trichotoma, floribus 2–5 ad apices ramulorum fasciculatis; bractaeae magnae, ad anthesin deciduae. Connectivum ciliolatum. — Species 26 et 27.

26. *Acranthera velutinervia* Brem. n. spec.; typus: *J. & M. S. Clemens 32093* (L.).

Herba suberecta, minime 50 cm. alta. Caulis primum breviter sed densissime, deinde minus dense fulvo-strigosus. diametro ad apicem 3 mm., basin versus usque ad 7 mm. aucto, internodiis 1.5–7 cm. longis. Folia petiolo 4.5–5.5 cm. longo, densissime fulvo-strigoso et insuper parce villosa instructa; lamina elliptica, 14–20 cm. longa et 6.5–10.5 cm. lata, apice acuta vel acuminata, basi contracta, margine ciliata, supra basin versus sparsissime strigosa, subtus costa nervisque densissime, inter nervos primum dense, deinde sparsius velutina, utrimque opaca, sicc. supra saturate rubro-brunnea, subtus brunnea, costa nervisque tamen pilorum praesentia fulvo-griseis, nervis utroque latere costae 6 vel 7. Stipulae oblongae, 3–4 cm. longae et 1.2–1.6 cm. latae, obtusae, extus ubique sed costa prominente et margine densius pubescentes, mox deciduae. Inflorescentia subsessilis; ramuli breviter sed densissime fulvo-strigosi, primarii 3–3.5 cm., secundarii 1.5–2 cm. longi; bractaeae ramulorum primariorum nondum visae, ramulorum secundariorum lineari-oblongae, 2.5 cm. longae et 5–6 mm. latae, acutae, extus intusque satis dense, margine densius pubescentes, costa prominula, a stipulis parvis connatae, mox deciduae; bractaeae aliae gradatim breviores et pro rato latiores; bractaeae florales calycis lobis similiores; omnes ad anthesin deciduae. Flores sessiles. Ovarium cylindricum, 8 mm. longum et 1 mm. diam., breviter sed densissime griseo-strigosum. Calycis lobi lanceolato-oblongi, 13 mm. longi et 4 mm. lati,

acuti, extus intusque satis dense, margine densius pubescentes, 7-nervii. Corolla citrina, 18 mm. longa, extus puberulo-pubescent, margine densius pubescente; tubus 13 mm. longus et 3.5 mm. diam.; lobi rotundati 5 mm. longi latique. Stamina 8 mm. longa; filamenta 2 mm.; antherae 6 mm. longae, connectivo in appendicem 0.5 mm. longam producto. Receptaculum pollinis 2 mm. longum et basi 1.4 mm. diam.; stigmata subulata 1 mm. longa. Fructus (*Clemens 26812*) 3 cm. longus et 1.8 mm. diam., sparse pubescens. Semina carunculata.

Habitat terrae Borneënsis partem septentrionalem.

BRITISH NORTH BORNEO: Mt. Kinabalu: Penibukan, alt. 1200 m., *J. & M. S. Clemens 32095* (L., typus, AA, dupl. typi); Dallas, alt. 900 m.; *id. 26812* (L, AA, co-typus fructifer).

This species is in habit and in the structure of the inflorescence very similar to *A. frutescens* Val. but differs conspicuously from that species in the smaller size of the leaves, the fewer nerves, on the underside velutinous, the longer and narrower calyx-lobes and the longer and narrower ovaries and fruits.

27. *Acranthera frutescens* Val. in Engl., Bot. Jahrb. 44: 551. 1910, et in Ic. Bog. 4: 286. 1914 in adnot. ad *A. multifloram* Val.; non Merr. in Univ. Calif. Publ. Bot. 15: 280. 1929, quae est species affinis nondum descripta; — anne *A. multiflora* Val. in Ic. Bog. 4: 286, t. 396. 1914, adhuc incertum, sed haud improbabile v. infra).

Herba suberecta, 1.5–2 m. alta. Caulis primum villösus vel hirsuto-villosus, deinde glabrescens, diametro ad apicem 8 mm., basin versus usque ad 11 mm. aucto, internodiis 1.2–3 cm. longis. Folia petiolo 3–8 cm. longo, primum villosa vel hirsuto-villosa, deinde plus minusve glabrescente instructa; lamina obovata, 30–35 cm. longa et 10–12 cm. lata, apice caudato-acuminata, basi cuneata vel contracta, margine primum dense, deinde sparse substrigosa, primum insuper sparse ciliata, supra primum praesertim basin versus sparse strigosa, ultimo plus minusve glabrescens, subtus primum costa nervisque dense villosa vel hirsuto-villosa et inter nervos breviter sed satis dense strigosa, deinde costa nervisque sparsius villosa vel hirsuto-villosa et inter nervos vix conspicue strigosa, utrimque opaca, sicc. supra nigrescens et subtus fuscens, nervis utroque latere costae 11 vel 12. Stipulae oblongae, 2.5 cm. longae et 1 cm. latae, obtusae, extus satis dense villosae vel hirsuto-villosae, costa vix prominula, mox deciduae. Inflorescentia subsessilis; ramuli dense fulvo-villosi, primarii ad anthesin circ. 1 cm., secundarii 7 mm. longi, post anthesin primarii usque ad 2.5 cm. et secundarii usque ad 1.5 cm. elongati; bracteae ovatae, 6–10 mm. longae et 3.5–6 mm. latae, extus et praesertim margine pubescentes, mox deciduae. Flores pedicello 0–2.5 mm. longo elati. Ovarium ovoideum, 2.5 mm. longum et 1.5 mm. diam., dense griseo-villosulum. Calycis lobi ovati, 6 mm. longi et 3–3.5 mm. lati, acuti, extus ubique sed margine densius pubescentes, 5-nervii, post anthesin usque ad 7 mm. longi et 5 mm. lati. Corolla viridula, extus griseo-villosula, fide Valetton 14–16 mm. longa; tubus 10–12 mm. longus; lobi late ovati, 4 mm. longi, acuti. Stamina 7 mm. longa, connectivo in appendicem filiformem 3 mm. (?) longam contracto. Fructus late cylindricus, 10 mm. longus et 4.5 mm. diam., villosus. Semina carunculata.



Habitat terrae Borneënsis partes occidentalem, australem et orientalem.

BORNEO: Southern and Eastern Division: Samarinda, between Semurung (S. Pasir) and S. Tarik, *Hub. Winkler 3032* (BD, typus), n.v.; West Kutai, near h. Puhus, alt. 90 m., *Endert 2501* (BZ). Western Division: Singkawang, district Landak, Ngabang, *Teysmann H.B. 11220* (L).

SARAWAK: Mt. Rayon, alt. 180 m., *Nat. coll. Ser. Mus. 5039* (AA); Mt. Matang, alt. 450 m., *J. & M. S. Clemens 22360* (AA).

The description given above has mainly been based on Endert's specimen. It deviates in the following points from the original one, given by Valeton: the number of pairs of nerves is 11 or 12, not 16; the bracts are slightly smaller (6–10 mm.  $\times$  3.5–6 mm. instead of 13 mm.  $\times$  8 mm.) and the calyx-lobes too are smaller (6 mm.  $\times$  3–3.5 mm. instead of 8 mm.  $\times$  5 mm.). The difference in the number of pairs of nerves is probably uncertain. As a comparison of Valeton's descriptions with the accompanying figures in the *Icones Bogorienses* prove, all nerves springing from the midrib were counted by him as primary ones, whereas I restrict the term to those which are readily comparable, leaving out the weaker nerves inserted in the intervals between the stronger ones. The differences in size of the bracts and the calyx-lobes offer a more serious difficulty, but these dimensions are probably rather variable.

*Acranthera multiflora* Val. in  *Ic. Bog. 4: 286, t. 396. 1914.* is probably conspecific. The details of the flower-structure given by Valeton, are not to be trusted. I have little doubt that his flowers were both too young and badly preserved, and Valeton himself, as the remarks at the end of his description prove, attached no value to these details. In the Sarawak specimens quoted above, which agree well with Valeton's figure, the thecae are ciliolate and the *receptaculum pollinis* mitriform. The most important difference lies in the greater length of the fruits, which are said to be 2 cm. long. It is, of course, possible that a comparison of the authentic specimens will reveal the presence of differences not mentioned in the description, and that more than one species will have to be recognized, but for the present I prefer to consider them conspecific.

*Elmer 20838*, collected near Tawao in British North Borneo, and referred by Merrill l.c. to *A. frutescens*, differs in the size of the leaves and in the fewer nerves. It resembles in these characters *A. velutinervia*, from which it differs in the nature of the indumentum and above all by the short fruits, which are more like those of *A. frutescens*. It is doubtless an undescribed species, but as there were no flowers in the specimens which I could investigate, I am unwilling to describe it. As the flowers are described by Elmer as pale green, it is very probable that they will have been preserved at least in some of his specimens.

#### SERIES B. PHILIPPINENSES

Herba ascendens, valde pilosa. Stipulae extus sine colletris. Inflorescentia trichotoma. Corolla extus tomentosa. Connectivum eciliolatum. Placentae utroque loculo ovarii confluentes. Semina reticulata.—  
Species 28.

28. *Acranthera philippinensis* Merr. in Philip. Jour. Sci. 8: Bot. 32. 1913, Enum. Philip. Fl. Pl. 3: 517. 1923.

Herba ascendens, circ. 60 cm. alta. Caulis dense pubescens, diametro ad apicem 6 mm., basin versus usque ad 8 mm. aucto, internodiis 0.5–2.5 cm. longis. Folia petiolo 2–7 cm. longo, dense pubescente instructa; lamina obovata vel oblanceolata, 9–25 cm. longa et 3–10 cm. lata, apice acuta vel brevissime acuminata, basi cuneata vel contracta, margine densissime pubescens, supra primum velutina, deinde sparse pilosa vel subglabra, a basibus pilorum scabridula, subtus costa nervisque densissime, venulis dense velutina, ceterum sparse pubescens, utrimque opaca, sicc. supra olivacea, subtus fusca, nervis utroque latere costae 8–11. Stipulae ovato-oblongae, 2–2.5 cm. longae et 1.2 cm. latae, subacutae, extus sparse villosae, subpersistentes. Inflorescentia subsessilis; bracteae oblongae, villosae; inferiores 2.5 cm. longae et 1 cm. latae; aliae gradatim minores. Flores subsessiles. Ovarium cylindricum, 8 mm. longum et 1.4 mm. diam., griseo-tomentosum. Calycis lobi ad anthesin lanceolati, 8 mm. longi et 2.8 mm. lati, fructu spathulati, 14 mm. longi et 3 mm. lati, extus intusque satis dense, margine densius pubescentes. Corolla alba vel rosea, extus tomentosa, margine longius ciliata; tubus 7 mm. longus et 3.5 mm. diam.; lobi rotundati, 2.5 mm. longi laetique. Stamina 6.5 mm. longa; filamenta 1 mm.; antherae 5.5 mm. longae, connectivo apiculato. Receptaculum pollinis 1 mm. longum et basi 1 mm. diam. Fructus 2.5 cm. longus et 4 mm. diam. Semina reticulata.

Habitat insulam Filipinam Mindanao dictam.

MINDANAO: Zamboanga, Merrill 8309 (L, exemplum typi); Ramos & Edaña B.Sc. 36647 (L); also near lake Lanao.

This species appears to be confined to the western part of Mindanao. As its nearest allies are found in Borneo, it would be interesting to know whether the genus is perhaps represented in the Sulu Islands too.

#### SERIES C. ITEOPHYLLAE

Herba ascendens. Folia anguste lanceolata, supra glaberrima. Stipulae scariosae. Inflorescentia semel trichotoma, floribus 3–5 ad apices ramulorum fasciculatis; bracteae parvae, mox deciduae. Connectivum eciliolatum. Discus squamis parvis cum filamentis alternantibus substitutus. — Species 29.

29. *Acranthera lanceolata* Val. in Ic. Bog. 4:282, t. 394. 1914; Merr. in Mitt. Inst. Allg. Bot. Hamburg 7: 283. 1937.

Herba ascendens, circ. 30 cm. alta, interdum pseudo-dichotome ramificata. Caulis pilis brevissimis primum densissime, deinde sparsius fulvo-strigosus, diametro ad apicem 2 mm., basin versus usque ad 4 mm. aucto, internodiis 0.5–3 cm. longis. Folia petiolo 1.5–2.5 cm. longo, pilis brevibus densissime fulvo-strigoso instructa; lamina lineari-lanceolata vel lanceolata, 6–10.5 cm. longa et 1.3–2.0 cm. lata, ter usque ad sexies longior quam lator, apice caudato-acuminata, basi acuta vel cuneata, margine dense strigosa, supra glaberrima, subtus costa nervis necnon venulis principalibus a pilis brevibus primum albidis, deinde fulvis, primum densissime, deinde sparsius strigosa, primum supra nitidula, deinde utrimque opaca, sicc. supra nigrescens, subtus fuscescens, nervis utroque latere costae 7–11,

venulis subtus colore saturatiore conspicuis. Stipulae oblongae, 18 mm. longae et 7 mm. latae, apice obtusae, extus pilis brevissimis sparsae. scariosae, sicc. brunnescentes, costa basin versus prominente, mox deciduae. Inflorescentia subsessilis; rachis et ramuli pilis brevissimis densissime fulvo-strigosi; rachis 1.5–2.5 cm., ramuli 0.6–1.0 cm. longi; bractae ovato-lanceolatae, circ. 2 mm. longae, extus sparse, margine densius pubescentes, mox deciduae. Flores breviter pedicellati. Pedicellus 0.5–2 mm. longus. Ovarium cylindricum, 6 mm. longum et 1.2 mm. diam., pilis brevissimis densissime fulvo-strigosum. Calycis lobi ovato-lanceolati, 6.5 mm. longi et 2.7–3.5 mm. lati, subobtusius, extus intusque pilis brevibus sparse, margine densius strigosi, 5-nervi. Corolla alba vel luteola, 10.5 mm. longa, extus pilis brevibus substrigosa; tubus 8 mm. longus et 3 mm. diam.; lobi 2.5 mm. longi latique, subobtusius. Stamina 7 mm. longa; filamenta 1.8 mm.; antherae 5.2 mm. longae, connectivo in appendicem anguste triangularem, 1.2 mm. longam producto. Receptaculum pollinis 1.3 mm. longum, basi 1.2 mm. diam. Fructus pedicello usque ad 3 mm. elongato elatus, 1.8 cm. longus et 2.2 mm. diam., sparse pubescens. Semina carunculata.

Habitat terrae Borneënsis partes centralem et orientalem.

CENTRAL BORNEO: Tadjuk, *Nieuwenhuis* 206 (1896/97); S. Haraseh, *id.* 214 (1896/97); S. Senoon, *id.* 30 (1898), omnes fide *Valeton* l.c. Western Division; S. Serawai near Djotta, 112° 30' E.long., 0° 30' S.lat., alt. 100 m., *Winkler* 323, fide *Merill* l.c.

SARAWAK: Saribas, Paku, *Haviland & Hose* 1562 (L).

The description given above has been based on the specimen collected by *Haviland & Hose*, but agrees in all essential points with that given by *Valeton*. The latter says of the inflorescences "vulgo tres in apice caulis umbellatae," but this is doubtless a mistake, for inflorescences arranged in this way are entirely unknown in this genus; the short common peduncle has apparently been overlooked. The *receptaculum pollinis*, which he in the usual way takes for the stigma, is accurately described as "conicum acutum," but badly represented in fig. 6, where it shows an ovoid shape.

This species is easily recognizable among all its allies by the narrowly lanceolate leaves. A rather curious feature are the five small disk-scales alternating with the stamens.

#### SERIES D. UMBELLIFLORAE

Herbae ascendentes vel subrosulares. Inflorescentia umbelliformis; bractae parvae. Connectivum eciliolatum. — Species 30–32.

30. *Acranthera Nieuwenhuisii* Val. in sched.; typus: *Jaheri* (Exped. *Nieuwenhuis*) 754 (L).

Herba ascendens, circ. 15 cm. alta. Caulis primum breviter sed densissime, deinde sparsius fulvo-strigosus, diametro ad apicem 1.7 mm., basin versus usque ad 2.5 mm. aucto, internodiis 8–12 mm. longis. Folia petiolo 7–10 mm. longo, breviter sed densissime fulvo-strigoso instructa; lamina lanceolata, 7–11 cm. longa et 2–3.3 cm. lata, apice acuta vel acuminata, basi acuta vel subacuta, margine dense strigosa, supra costa quae basin versus est dense fulvo-strigosa excepta glaberrima, subtus costa nervisque



densissime, venulis principalibus sparsius strigosa, utrimque opaca, sicc. supra saturate brunnea, subtus fusca, nervis utroque latere costae 5 vel 6. Stipulae oblongae, 1.7 cm. longae et 5.5 mm. latae, apice acutae, extus pilis brevibus sparsae, margine ciliatae, sicc. brunneae, costa praesertim basin versus prominente, ante folia deciduae. Inflorescentia subsessilis, circ. 6-flora, basi bracteis linearibus 5 mm. longis et 0.5 mm. latis instructa. Flores pedicello circ. 10 mm. longo, breviter sed densissime fulvo-strigoso elati. Ovarium cylindricum, 8 mm. longum et 1 mm. diam., ut pedicellus densissime fulvo-strigosum. Calycis lobi lineares, 11 mm. longi et 1.5–1.8 mm. lati, caudato-acuminati, extus intusque pilis brevibus sparse, margine dense strigosi, 3- vel 5-nervii. Corolla colore ignoto, 2 cm. longa, extus breviter strigosa; tubus 14 mm. longus et 4.5 mm. diam.; lobi ovati, 5.5 mm. longi et 3.5 mm. lati, acuti. Stamina 9 mm. longa; filamenta 3 mm.; antherae 6 mm. longae, connectivo in appendicem anguste triangularem, 1.3 mm. longam exeunte. Stylus basi paulum incrassatus; receptaculum pollinis 2.5 mm. longum et basi 0.8 mm. diam.; stigmata subulata 1.5 mm. longa. Fructus nondum notus.

Habitat terrae Borneënsis partem centralem.

CENTRAL BORNEO: s.l., *Jaheri* (Exped. Nieuwenhuis) 754 (L, typus).

*Acranthera Nieuwenhuisii* comes very near to *A. Hallierii* Val., from which it differs in the greater length of the internodes, the lanceolate, entirely green, less conspicuously ciliated leaves, the oblong stipules, the linear calyx-lobes and the greater length of the points in which the connectives are drawn out. Both species are in general aspect not unlike some species belonging to the subgenus *Dichroanthes*, namely *A. variegata* Merr. and *A. aurantiaca* Val. ex Brem., from which they are, of course, easily distinguishable by the eciliolate anthers and the mitriform *receptaculum pollinis*, and probably also by the colour of the corolla. It is true that the colour of the corolla in *A. Nieuwenhuisii* is unknown, but as that of *A. Hallierii* is said to be white, there is good reason to assume that the flowers of *A. Nieuwenhuisii* too will be white.

31. *Acranthera Hallierii* Val. in Ic. Bog. 4: 183, t. 356. 1913.

Herba subrosularis. Caulis ad apicem pilis satis longis strigosus, basin versus glabrescens, diametro ad apicem 2 mm., basin versus usque ad 3.5 mm. aucto, internodiis circ. 5 mm. longis. Folia petiolo 0.5–2.5 cm. longo, primum dense, deinde sparsius strigoso instructa; lamina elliptico-lanceolata vel obovata, 6.5–11 cm. longa et 2.5–4.5 cm. lata, apice acuta vel subacuminata, basi acuta vel subtruncata et prope petiolum subito contracta, margine densissime et satis longe strigosa, supra costa quae basin versus est sparse strigosa excepta glaberrima, subtus costa nervisque densissime, venulis sparsius et brevius strigosa, utrimque opaca, variegata, sicc. supra saturate brunnea, subtus fusca, nervis utroque latere costae 6 vel 7. Stipulae ovatae, 13 mm. longae et 6 mm. latae, obtusae, extus sparse strigosae, costa prominula, deciduae. Inflorescentia subsessilis, e floribus 2–6 composita; bractae angustae, vix conspicuae. Flores pedicello usque ad 1.5 cm. longo, pilis brevibus dense griseo-strigoso elati. Ovarium cylindricum, 5 mm. longum et 1 mm. diam., ut pedicellus dense griseo-strigosum. Calycis lobi lanceolati, 8.5 mm. longi et 1.7–2 mm. lati,

acuti, extus sparse, costa et margine densius strigosi. Corolla alba, 17 mm. longa, extus pilis brevibus dense strigosa; tubus 11 mm. longus et 5 mm. diam.; lobi ovato-triangulares, 6-7 mm. longi et 3 mm. lati. Stamina 10 mm. longa; filamenta 3 mm.; antherae 7 mm. longae, connectivo in appendicem vix 0.5 mm. longam producto. Receptaculum pollinis 2 mm. longum et basi 0.8 mm. diam.; stigmata subulata 0.5 mm. longa. Fructus nondum notus.

Habitat terrae Borneënsis partem centralem.

CENTRAL BORNEO: s.l., Amdjah (Exped. Nieuwenhuis) 310 (L, exemplum typi).

The figure and description given by Valetton of the *receptaculum pollinis* are wrong, and the white patches of the leaves are neither mentioned nor shown.

32. *Acranthera atropella* Stapf in Trans. Linn. Soc. Bot. II, 4: 173. 1894. — British North Borneo.

Specimens of this species were collected by Low & Haviland on the slopes of Mt. Kinabalu at an altitude of 1500-1800 m. It reaches, therefore, a greater height than any of its allies. Its position in the subgenus *Mitracme* is not yet fully assured, for Stapf describes the *receptaculum pollinis*, which he too confuses with the stigma, as capitate, but as his description in other respects closely resembles those given above of *A. Nieuwenhuisii* and *A. Hallierii*, I have little doubt that its *receptaculum pollinis* is in reality mitriform. The corolla has been described as "obscure cyaneum," but this may be the colour it assumes in the herbarium: the flowers of the other Bornean species are, at least in the living state, never blue. The similarity between this species and *A. Hallierii* has been noticed already by Valetton, who, however, gave an erroneous interpretation of the structure of their inflorescences (cf. Ic. Bog. 4: 182. 1913). He thought that the flowers were in reality axillary, the umbellate arrangement being simulated by the shortness of the upper internodes, but in *A. Hallierii* the flowers are by no means subtended by ordinary leaves, but by minute bracts, and the inflorescence is doubtless cymoso-umbellate. Stapf describes the flowers of *A. atropella* as "pseudo-umbellate," but this means probably that the flowers do not open centripetally, as in a true umbel, but centrifugally. As he says that the inflorescence is sessile and at the base surrounded by the two upper pairs of leaves with their stipules, the possibility that the flowers might be axillary, seems excluded. True umbels are probably unknown in the whole family; when the flowers are fascicled at the top of a common peduncle, the arrangement always seems to be entirely or partly cymose.

Stapf mentions a minute white punctuation of the upper side of the leaves caused by collapsed cells. This punctuation has also been observed in *A. Nieuwenhuisii* and in the three species belonging to the next subgenus.

#### SUBGENUS I. ATHROOPHLEPS BREM. SUBGEN. NOV.

Herbae ascendentes vel suberectae. Folia supra sub lente cellulis collapsis albo-punctata, venulis ad nervos plus minusve perpendicularibus

et valde approximatis utrimque transverse striata. Stipulae oblongae vel obovatae, obtusae, internodiis superioribus subaequilongae, dense reticulatae, plerumque deciduae. Inflorescentia terminalis. Flores sessiles vel subsessiles. Ovarium turbinatum. Corolla alba, tubo anguste campanulato. Stamina filamentis glabris et liberis, quam antheris multo brevioribus, antheris eciliolatis, connectivo in appendicem filiformem producto. Discus inconspicuus. Stylus cylindricus; receptaculum pollinis annulare. Fructus cylindricus.

Species adhuc notae tres terrae Borneënsis partem septentrionalem habitantes. Subgeneris typus: *A. athroophlebia* Brem. n. spec. v. infra.

#### KEY TO THE SPECIES

Flowers laxly paniculate; bracts deciduous. Leaves, calyx and corolla, apart from the ciliate margin, entirely glabrous.—North Borneo.....33. *A. athroophlebia*  
Flowers subcapitate; bracts persistent. Leaves on the underside, at least on the nerves, as well as calyx-lobes and outside of the corolla, pubescent.

Leaves with 6–10 pairs of nerves; midrib and nerves hirt-pubescent on the underside. Stipules early deciduous.—North Borneo.....34. *A. capitata*

Leaves with 4–5 pairs of nerves; midrib and nerves strigose on the underside.

Stipules subpersistent.—North Borneo.....35. *A. Ruttenii*

33. *Acranthera athroophlebia* Brem. n. spec.; typus: *J. & M. S. Clemens 30616* (L).

Herba suberecta, usque ad 90 cm. alta. Caulis sulcis interdum primum pulverulentus, mox totus glabrescens, diametro ad apicem 5 mm., basin versus usque ad 10 mm. aucto, internodiis superioribus 3–7 cm. longis, sicc. nigrescens. Folia petiolo 4–5 cm. longo, glabro, sicc. nigrescente instructa; lamina oblanceolata vel obovata, 16–29 cm. longa et 4.7–10 cm. lata, apice acuta vel sensim et vix conspicue acuminata, basi cuneata, margine parce sed longius ciliata, ceterum glabra, utrimque opaca, sicc. supra nigrescens, subtus fuscescens, nervis utroque latere costae 6–8. Stipulae oblongae, 2–3 cm. longae et 1–1.5 cm. latae, apice rotundatae, interdum tamen breviter mucronatae, costa prominente, extus glabrae, deciduae. Inflorescentia nunc subsessilis nunc pedunculo usque ad 3 cm. longo elata, laxè paniculiformis; rachis ad anthesin circ. 7 cm. longa, postea usque ad 18 cm. elongata; rachis ramulique glabri, sicc. nigrescentes; ramuli ultimi monochasiales, post anthesin usque ad 5 cm. elongati, multiflori; bractae ovatae, concavae et basi saccatae, plerumque circ. 1 cm. longae, margine dense ciliatae, ceterum glabrae, sicc. fuscrescentes, ad anthesin deciduae. Flores subsessiles. Ovarium 5 mm. longum et 2.7 mm. diam., glabrum. Calycis lobi oblongi, 7.5 mm. longi et 2.5 mm. lati, acuti, margine ciliati, ceterum glabri, nervis circ. 7 quorum 3 fortiores instructi. Corolla margine ciliata, ceterum glabra; tubus 9 mm. longus et 4 mm. diam.; lobi ovati, 4 mm. longi et 3 mm. lati, acuti, dimidio superiore reflexo et reduplicato. Stamina 7 mm. longa; filamenta 1.8 mm.; antherae 5.2 mm. longae, connectivo carinato in appendicem contortam, 1.7 mm. longam producto. Stylus supra receptaculum pollinis obtusus. Fructus late cylindricus, 15 mm. longus et 4 mm. diam., glaber. Semina reticulata.

Habitat terrae Borneënsis partem septentrionalem.

BRITISH NORTH BORNEO: Mt. Kinabalu, Penibukan, alt. 1200 m., *J. & M. S. Clemens 30616* (L, typus, AA, dupl. typi, BZ, tripl. typi); *id. 31308* (AA), *32136* (L, AA).



In the colour which it assumes in drying, and in the presence of collapsed cells on the upper side of the leaves, this species resembles *A. atropella* Stapf, from which it differs, however, conspicuously in its almost complete glabrescence, in the larger size of the leaves and stipules, and above all in the paniculately arranged, subsessile flowers. As Stapf states that in his species the venules are indistinct, the possibility that it might belong to the subgenus *Athroophleps*, need not be taken seriously.

The differences between this species and the two next ones have been summarized in the key.

34. *Acranthera capitata* Val. in Ic. Bog. 4: 275, t. 391. 1914.

Herba ascendens, circ. 30 cm. alta, post anthesin decumbens et ex axillis inferioribus innovationes emittens. Caulis primum pilis rufo-fuscis breviter pubescens, deinde glabrescens, diametro ad apicem 2.5 mm., basin versus usque ad 7 mm. aucto, internodiis superioribus 0.5–3 cm. longis, inferioribus usque ad 7 cm. longis, sicc. fuscescens. Folia petiolo 2.5–7 cm. longo, dense pubescente, sicc. olivaceo-brunneo instructa; lamina elliptica vel saepius obovata, 13–25 cm. longa et 6.5–9 cm. lata, subobtusata vel vix conspicue acuminata, basi acuta vel saepius cuneata, margine dense ciliata, supra primum pubescens, mox glabrescens, subtus costa nervis nec non venulis fortioribus dense hirtopubescentibus, ceterum subglabra, utrumque opaca, sicc. supra saturate olivacea, subtus fusca, nervis utroque latere costae 6–10. Stipulae ellipticae vel obovatae, 12–15 mm. longae et 8–12 mm. latae, apice rotundatae, costa basin versus prominente, extus primum satis dense, costa densius pubescentes, margine dense ciliatae, deciduae. Inflorescentia breviter pedunculata, plus minusve capituliformis, re vera pentachotome corymbosa, ramulis brevissimis; pedunculus dense hirtopubescentibus, 1–2 cm. longus, recurvatus; bractae exteriores ovatae, 12 mm. longae et 7 mm. latae; aliae gradatim minores et praesertim angustiores; omnes sicc. fusciscentes, extus sparse, intus densius pubescentes, margine dense ciliatae, ad anthesin persistentes. Flores sessiles. Ovarium 3 mm. longum et 1.2 mm. diam., dense griseo-pubescentibus. Calycis lobi lanceolati, 5 mm. longi et 1.8 mm. lati, acuti, margine ciliati, extus intusque pubescentes, nervis 3 vel 5 quorum 3 fortiores instructi. Corolla extus parce pubescens, margine ciliata; tubus 7 mm. longus et 4 mm. diam.; lobi 2.8 mm. longi et 1.9 mm. lati, acuti. Stamina 6.7 mm. longa; filamenta 1.6 mm.; antherae 5.2 mm. longae, connectivo vix conspicue carinato in appendicem rectam, 0.9 mm. longam producto. Fructus glaber dictus, nondum plene maturus 10 mm. longus et 2 mm. diam.

Habitat terrae Borneënsis partem septentrionalem.

BORNEO: Eastern and Southern Division, Tidoong: Ulu Sebulu, *Amdjah* 634 (L, dupl. typi); S. Tultit, *id.* 664 (L).

According to Valetton l.c. the flowers of *Amdjah* 664 should be violet, those of the other specimens white; maybe the colour changes before the corolla is shed.

The differences between this species and *A. Ruttanii* Brem. are given in the key. Although rather different in aspect, they are doubtless nearly related.

35. *Acranthera Ruttenii* Brem. n. spec.; typus: *Rutten 642* (U).

Herba suberecta, circ. 60 cm. alta, post anthesin decumbens et ex axillis inferioribus innovationes emittens. Caulis primum pilis longis strigosus, deinde glabrescens, diametro ad apicem 1.5 mm., basin versus usque ad 3 mm. aucto, internodiis superioribus 0.8–1.5 cm. longis, inferioribus usque ad 11.5 cm. longis, sicc. saturate olivaceus. Folia petiolo 1.5–2.5 cm. longo, dense strigoso-villoso, sicc. olivaceo instructa; lamina lanceolata vel obovata, 8–11 cm. longa et 4–5 cm. lata, apice acuminata, basi contracta, margine dense ciliata, supra primum sparse villosa, deinde glabrescens, subtus costa nervis nec non venulis fortioribus dense strigosa, ceterum glabra, utrimque opaca, sicc. supra olivacea, subtus dilute fusca, nervis utroque latere costae 4 vel 5. Stipulae oblongo-ellipticae, 13–15 mm. longae et 8–9 mm. latae, apice truncatae, costa basin versus prominente, extus primum praesertim costa parce villosae, margine primum densius ciliatae, subpersistentes. Inflorescentia pedunculata, capituliformis; pedunculus dense griseo-pubescent, circ. 1 cm. longus, patens; bractae exteriores ovatae, 13 mm. longae et 7.5 mm. latae; aliae angustiores; omnes sicc. fusciscentes, extus sparse et intus densius pubescentes, margine dense ciliatae, ad anthesin persistentes. Flores sessiles. Ovarium 4 mm. longum et 2.2 mm. diam., dense griseo-pubescent. Calycis lobi lineari-lanceolati vel lineari-oblongi, 7.5 mm. longi et 1.8–2.2 mm. lati, acuti, margine ciliati, extus vix conspicue, intus densius pubescentes, nervis circ. 5 quorum 3 fortiores instructi. Corolla extus sericeo-villosa, margine ciliata; tubus 7 mm. longus et 3 mm. diam.; lobi 2.7 mm. longi et 2 mm. lati, acuti. Stamina 6.5 mm. longa; filamenta 1 mm.; antherae 5.5 mm. longae, connectivo vix conspicue carinato in appendicem rectam, 0.7 mm. longam producto. Fructus nondum notus.

Habitat terrae Borneënsis partem septentrionalem.

BORNEO: Eastern and Southern Division: Bulongan, S. Sadjau, 117° 40' E. long., 2° 40' N. lat., *Rutten 642* (U, typus).

#### INDEX SPECIERUM

21. *abbreviata* Val. in Ic. Bog. 4: 181, t. 355. 1913 — West Borneo.

1. *anamallica* Bedd., Ic. Pl. Ind. Or. 1: 5, t. 23. 1874 — Indian Peninsula.

33. *athroopplebia* Brem. n. spec. — North Borneo.

32. *atropella* Stapf in Trans. Linn. Soc. Bot. II, 4: 173. 1894 — North Borneo.

16. *aurantiaca* Val. ex Brem. n. spec. — West Borneo.

20. *axilliflora* Val. in Bot. Jahrb. 44: 550. 1910 — South-east Borneo.

12. *bullata* Merr. in Mitt. Inst. Allg. Bot. Hamburg 7: 284. 1937 — West Borneo.

34. *capitata* Val. in Ic. Bog. 4: 275, t. 391. 1914 — North Borneo.

3. *\*ceylanica* Arn. ex Meisn., Pl. Vasc. Gen. 2: 115. 1838 — Ceylon.

didymocarpus H. H. W. Pearson ex Ridl. in Jour. Fed. Mal. States Mus. 4: 32. 1909, in syn.: *Gardenia didymocarpus* Ridl.

24. *Endertii* Brem. n. spec. — East Borneo.

27. *frutescens* Val. in Bot. Jahrb. 44: 551. 1910 — Borneo, North Borneo excepted.

2. *grandiflora* Bedd., Ic. Pl. Ind. Or. 1: 5, t. 25, 1874 — Indian Peninsula.

Griffithii Hook.f., Fl. Brit. Ind. 3: 92. 1880 = *Asemanthia Griffithii* (Hook.f.) Brem. n. comb.

31. *Hallieri* Val. in Ic. Bog. 4: 183, t. 356. 1913 — Central Borneo.
22. *hirtistipula* Val. in Ic. Bog. 4: 277, t. 392. 1914 — Central Borneo.
11. *involutocrata* Val. in Ic. Bog. 4: 279, t. 393. 1914 — West Borneo.
13. *Johannis-Winkleri* Merr. in Mitt. Inst. Allg. Bot. Hamburg 7: 285. 1937 — West Borneo.
29. *lanceolata* Val. in Ic. Bog. 4: 281, t. 394. 1914 — Central and West Borneo.
8. *longipes* Merr. in Papers Mich. Acad. Sci. 19: 194. 1934 — East Sumatra.  
*longipes* Merr. in Mitt. Inst. Allg. Bot. Hamburg 7: 284. 1937, homonym. illeg.=  
*longipetiolata*.
19. *longipetiolata* Merr. ex Brem. n. nom. (*longipes* Merr. 1937, non 1934) — West Borneo.
23. *maculata* Val. in Ic. Bog. 4: 283, t. 395. 1914 — Central Borneo.  
Maingayi Hook.f., Fl. Brit. Ind. 3: 92. 1880=Asemanthia Maingayi (Hook.f.)  
Ridl. in Kew Bull. 1939: 600. 1939.
18. *megaphylla* Brem. n. spec. — Borneo.
14. *monantha* Val. in Bot. Jahrb. 48: 111. 1912 — North (?) Borneo.  
*multiflora* Val. in Ic. Bog. 4: 285, t. 396. 1914, probabiliter=*frutescens*.  
*multinervia* Val. in sched. cf. *bullata*.  
*mutabilis* Hemsl. in Jour. Bot. 25: 204. 1887 (Mussaenda mutabilis Hemsl. in  
Hook., Ic. Pl. t. 1718. 1887)=Asemanthia Maingayi (Hook.f.) Ridl. in Kew  
Bull. 1939: 600. 1939.  
*mutica* Val. in sched. cf. *simalurensis*.
30. *Nieuwenhuisii* Val. ex Brem. n. spec. — Central Borneo.
7. *ophiorrhizoides* Val. in Ic. Bog. 4: 287, t. 397. 1914 — North Borneo.
25. *parviflora* Val. in Ic. Bog. 4: 289, t. 398. 1914 — West Borneo.
28. *philippinensis* Merr. in Philip. Jour. Sci. Bot. 8: 32. 1913 — Mindanao.
35. *Ruttenii* Brem. n. spec. — North Borneo.
17. *salmonia* Brem. n. spec. — East Borneo.
5. *siamensis* (Kerr) Brem. n. comb. (*Psilobium siamense* Kerr in Hook., Ic. Pl. t.  
3332. 1937) — Peninsular Siam.
6. *siliquosa* Brem. n. spec. — East Borneo.
10. *simalurensis* Brem. n. spec. — Simalur.  
*strigosa* Val. in Ic. Bog. 4: 291, t. 399. 1914, species incertae sedis nondum visa —  
Central Borneo.
4. *tomentosa* R.Br. ex Hook.f., Fl. Brit. Ind. 3: 92. 1880 — Assam.  
*uniflora* (Wall. ex G. Don) Kurz in Jour. As. Soc. Bengal 41 (2): 312. 1872  
(Mussaenda uniflora Wall. ex G. Don)=Aphaenandra uniflora (Wall. ex G.  
Don) Brem. in Blumea, Suppl. 1: 121. 1937.
15. *variegata* Merr. in Mitt. Inst. Allg. Bot. Hamburg 7: 285. 1937 — West Borneo.
26. *velutinervia* Brem. n. spec. — North Borneo.
9. *Yatesii* Merr. in Papers Mich. Acad. Sci. 19: 194. 1934 — East Sumatra.  
zeylanica Arn. in Ann. Nat. Hist. 3: 21. 1839=ceylanica.

ZEIST,

HOLLAND.



## TROPICAL FERN HOSTS OF RUST FUNGI

J. H. FAULL

RUSTS ON FERNS are referred in current literature on mycology and plant pathology to the definitive genera *Hyalopsora*, *Milesia*, *Uredinopsis*, *Desmella* and *Puccinia* and in a few instances to the imperfect genus *Uredo*. The complete life-histories of many species of the first three have already been determined experimentally; in all cases they have proved to be heteroecious, with species of *Abies* serving exclusively as their aecial hosts. So it may quite safely be assumed that the same pattern is potentially true of all the other species of *Hyalopsora*, *Milesia* and *Uredinopsis*. Regarding *Desmella*, uredia and telia only are known; and as they are so unlike those of the three foregoing genera, the identities of hosts that can carry the aecial stages of *Desmella* rusts are not even conjectured. It is a strange genus, taxonomically standing quite apart from the other fern-restricted genera. Thus far it has been reported from the American tropics only. Among the remaining fern rusts, a single species of *Puccinia* has been described, though solely with respect to its uredia and telia. Finally, as to the *Uredo* fern rusts, they can with reasonable certainty be recognized as uredo stages of one or other of the five definitive genera. Indeed, not a few of the named species of these genera have been described from the uredo stage and without knowledge of telia. Although technically open to some objections, this practice does offer advantages if used with discretion.

With possible exceptions of Australia and Tasmania, fern rusts are world-wide in distribution. Of course, locally within any extensive region there may be limiting factors, such, for example, as continuously high day and night temperatures. Otherwise they are likely to be found wherever ferns grow and on a surprisingly large number of specific hosts. Naturally, where those that are *Abies*-infecting occur beyond the ranges of *Abies*, they can be perpetuated solely by seasonal transmission from affected ferns to plants of identical kind or of species that are likewise susceptible. Indeed, as the southern distributional limits of *Abies* are approached, this method becomes increasingly frequent, even in those rust species that lack amphispores. Of course this method is possible for amphispore-producing rusts in any latitude, but otherwise only wherever there is a sufficiently close overlapping of successive seasonal crops of fronds, that is, a succession within the vital life-span of ordinary urediospores. It may not be superfluous to recall to mind here that the most southerly ranges of existing *Abies*, though well within the tropics in the western hemisphere and reaching to the tropics in the eastern, fall far short of the equator.

TABLE I  
PUBLISHED TROPICAL FERN HOSTS, THEIR RUSTS AND  
REGIONAL ORIGINS

Fern hosts	Rusts	Regional origins
1. <i>Adiantum andicola</i> Liebm.	<i>Uredinopsis investita</i> Faull	Guatemala†
2. <i>Anemia fulva</i> (Cav.) Sw.	<i>Desmella Aneimiae</i> (Henn.) Syd.	Brazil
3. <i>Anemia Phyllitidis</i> (L.) Sw.	<i>Desmella</i>	Brazil
4. <i>Anemia tomentosa</i> (Sav.) Sw. ( <i>A. cheilanthoides</i> Kaulf.)	<i>Desmella Aneimiae</i> (Henn.) Syd.	Brazil†
5. <i>Antrophyum lanceolatum</i> (L.) Kaulf.	<i>Hyalopsora Polytaenii</i> (KCT) Cummins	Dominican Republic†; Porto Rico
6. <i>Blechnum occidentale</i> L.	<i>Milesia australis</i> Arthur	Colombia†; Costa Rica; Porto Rico
7. <i>Blechnum unilaterale</i> Sw. [ <i>B. blechnoides</i> (Lagerh.) C. Chr.]	<i>Uredinopsis Mayoriana</i> Diet.	Colombia†
8. <i>Blechnum volubile</i> Kaulf.	<i>Desmella (Uredo blechnicola</i> Henn.)	Brazil†
9. <i>Cheilanthes pyramidalis</i> Fée	<i>Uredinopsis glabra</i> Faull	Mexico
10. <i>Coniogramme fraxinea</i> (Don) Diels	<i>Milesia Coniogrammes</i> (Hirats. f.) n. comb. ( <i>Milesina Conio-</i> <i>grammes</i> Hirats. f.)	Formosa
11. <i>Cystopteris fragilis</i> (L.) Bernh.	<i>Uredinopsis glabra</i> Faull	Mexico†
12. <i>Dennstaedtia rubiginosa</i> (Kaulf.) Moore	<i>Desmella</i>	Porto Rico
13. <i>Dennstaedtia rubiginosa</i> (Kaulf.) Moore	<i>Milesia Dennstaedtia</i> (Diet.) Faull	Colombia†
14. <i>Dryopteris</i> sp. [Close to <i>D. oligocarpa</i> (H. & B.) Kuntze]	<i>Milesia andina</i> Faull	Ecuador†
15. <i>Dryopteris Clarkei</i> (Bak.) Kuntze	<i>Milesia Miyabei</i> (Kamei) Faull	Formosa
16. <i>Dryopteris dentata</i> (Forsk.) C. Chr. [ <i>D. mollis</i> (Jacq.) Hieron.]	<i>Desmella</i>	Porto Rico
17. <i>Dryopteris patens</i> (Sw.) Kuntze	<i>Milesia consimilis</i> Arthur	Jamaica†
18. <i>Dryopteris Poiteana</i> (Bory) Urban	<i>Desmella</i>	Porto Rico
19. <i>Dryopteris Poiteana</i> f. <i>proli-</i> <i>fera</i>	<i>Desmella</i>	Venezuela

TABLE I (Continued)

Fern hosts	Rusts	Regional origins
20. <i>Dryopteris quadripinnata</i> Hayata	<i>Milesia carpatica</i> var. <i>erythrosora</i> Faull [ <i>Milesina erythrosora</i> (Faull) Hirats. f.]	Formosa
21. <i>Dryopteris tetragona</i> (Sw.) Urban	<i>Desmella</i>	Porto Rico
22. <i>Dryopteris tetragona</i> var. <i>guadalupensis</i> C.Ch.	<i>Desmella</i>	Venezuela
23. <i>Elaphoglossum</i> sp.	<i>Hyalopsora obovata</i> (Arthur) Cummins	Colombia
24. <i>Elaphoglossum latifolium</i> (Sw.) J. Sm.	<i>Hyalopsora obovata</i> (Arthur) Cummins	Jamaica†
25. <i>Lygodium micans</i> Sturm ( <i>Lygodium</i> sp.)	<i>Uredo</i> ( <i>Milesina Lygodii</i> Syd.)	Br. Guiana
26. <i>Lygodium polymorphum</i> (Cav.) HBK	<i>Puccinia Lygodii</i> (Hariot) Arthur	Brazil†; San Salvador; Trinidad; Venezuela
27. <i>Lygodium volubile</i> Sw.	<i>Uredo</i>	Brazil
28. <i>Nephrolepis cordifolia</i> (L.) Presl	<i>Milesia philippinensis</i> (Syd.) n. comb. ( <i>Milesia tenuis</i> Faull)	Philippine Islands†
29. <i>Nephrolepis pendula</i> (Raddi) J. Sm.	<i>Milesia columbiensis</i> (Diet.) Arthur	Colombia†
30. <i>Nephrolepis rivularis</i> (Vahl) Mett.	<i>Milesia insularis</i> Faull	Porto Rico†
31. <i>Onychium japonicum</i> (Thunb.) Kunze ( <i>Crypto-</i> <i>gramme japonica</i> Prantl)	<i>Milesia Cryptogrammes</i> (Diet.) n. comb. [ <i>Milesina Crypto-</i> <i>grammes</i> (Diet.) Hirats. f.]	Philippine Islands
32. <i>Pellaea cardiomorpha</i> Weath.	<i>Uredinopsis glabra</i> Faull	Mexico
33. <i>Pellaea ternifolia</i> (Cav.) Link	<i>Hyalopsora Cheilanthis</i> (Peck) Arthur	Ecuador
34. <i>Pellaea viridis</i> (Forsk.) Prantl [ <i>Pellaea hastata</i> (Thunb.) Prantl]	<i>Milesia nervisequa</i> (von Thü- men) Faull	Madagascar
35. <i>Pityrogramma calomelanos</i> (L.) Link	<i>Desmella</i>	Ecuador†; Venezuela
36. "Polypodiaceae sp."	<i>Desmella</i>	Ecuador
37. <i>Polypodium arisanense</i> Hay- ata	<i>Milesia Hashiokai</i> (Hirats. f.) n. comb. ( <i>Milesina Hashiokai</i> Hirats. f.)	Formosa†
38. <i>Polystichum amabile</i> (Bl.) J. Sm.	<i>Milesia arisanensis</i> (Hirats. f.) n. comb. ( <i>Milesina arisanense</i> Hirats. f.)	Formosa†



TABLE I (Continued)

Fern hosts	Rusts	Regional origins
39. <i>Pteridium aquilinum</i> (L.) Kuhn, including varieties and marginal species	<i>Uredinopsis macrosperma</i> (Cooke) Magn.	Brazil; Colombia; Cuba; Guatemala; Honduras; Jamaica; Mexico; Panama; Venezuela; Belgian Congo†
40. <i>Pteridium aquilinum</i> var. <i>de-</i> <i>compositum</i> (Gaud.) Tryon	<i>Uredinopsis aspera</i> Faull	Hawaii
41. <i>Pteridium aquilinum</i> var. <i>-</i> <i>Wightianum</i> (Agardh) Tryon	<i>Uredinopsis Hashiokai</i> Hirats. f.	Formosa†

†Where type was collected.

Not much collecting of fern rusts has been done in the tropics. Yet there is a considerable accumulation from mainly incidental collecting over the years. These are listed above in Table I, and it is quite an impressive compilation. But my own limited, yet intensive collectings in the tropics of North America, supplemented by occasional contributions from correspondents and a few gleanings from fern collections in the Gray Herbarium of Harvard University, are sufficient to show that the number of known fern hosts is probably a small representation of fern species that, in one region or another, carry rust fungi. Table II presents new acquisitions obtained by me in the ways indicated above. Among these are unpublished collecting records of a few species listed in Table I; they are marked with an asterisk (\*).

One of the reasons for publishing these lists before detailed studies have been completed on them is to call the attention of collectors in the tropics to a seemingly passed-by group of rust hosts. They will also serve to indicate that our knowledge of fern and fir rusts is far from complete. But now at least enough materials and sources of supply are available to justify more adequate taxonomic review and a wider range of other investigations.

TABLE II

## NEW RECORDS FOR TROPICAL FERN HOSTS OF RUST FUNGI

Fern hosts	Rusts	Regional origins
A. Fam. Ophioglossaceae		
1. <i>Botrychium virginianum</i> (L.) Sw.	<i>Hyalopsora</i>	Guatemala
B. Fam. Schizaeaceae		
2. <i>Anemia hirsuta</i> (L.) Sw.	<i>Desmella</i>	Jamaica; Mexico
3. <i>Anemia hirsuta</i> (L.) Sw.	<i>Milesia</i>	Jamaica; Mexico
4. <i>Lygodium heterodoxum</i> Kunze	<i>Uredo</i>	Guatemala
C. Fam. Gleicheniaceae (?)		
5. <i>Gleichenia</i> sp. (?)	<i>Milesia</i>	New Guinea
D. Fam. Cyatheaaceae		
6. <i>Cyathea</i> sp.	<i>Hyalopsora</i>	New Guinea
7. <i>Cyathea fulva</i> (M. & G.) Fée	<i>Milesia</i>	Mexico
8. <i>Cyathea Harrisii</i> Underw.	<i>Milesia</i>	Jamaica
9. <i>Cyathea mexicana</i> Schl. & Cham.	<i>Milesia</i>	Guatemala
E. Fam. Polypodiaceae		
10. <i>Adiantum Capillus-veneris</i> L.	<i>Hyalopsora</i>	Mexico
11. <i>Adiantum latifolium</i> Lam.	<i>Desmella</i>	Trinidad
12. <i>Adiantum subcordatum</i> Sw.	<i>Hyalopsora</i>	Brazil
13. <i>Anogramma chaerophylla</i> (Desv.) Link	<i>Hyalopsora</i>	Mexico
14. <i>Anogramma chaerophylla</i> (Desv.) Link	<i>Uredinopsis</i>	Mexico
15. <i>Asplenium malayo-alpinum</i> Holtt.	<i>Milesia</i>	New Guinea
16. <i>Asplenium monanthes</i> L.	<i>Hyalopsora</i>	Guatemala; Mexico
17. <i>Asplenium monanthes</i> var. <i>Galeotti</i> (Fée) Hieron.	<i>Hyalopsora</i>	Mexico
18. <i>Athyrium</i> sp.	<i>Hyalopsora</i>	New Guinea
19. <i>Athyrium Dombei</i> Desv.	<i>Uredinopsis</i>	Guatemala; Mexico
20. <i>Athyrium paucifrons</i> C. Chr. (?)	<i>Milesia</i>	Mexico
21. <i>Athyrium Skinneri</i> Moore	<i>Hyalopsora</i>	Mexico
22. <i>Blechnum</i> sp.	<i>Milesia</i> or <i>Hyalopsora</i>	New Guinea
23. <i>Blechnum fraxineum</i> Willd.	<i>Milesia</i>	Venezuela

TABLE II (Continued)

Fern hosts	Rusts	Regional origins
24. <i>Blechnum occidentale</i> L.*	<i>Milesia</i>	Cuba; Guatemala; Jamaica; Mexico; Panama; Venezuela
25. <i>Blechnum orientale</i> L.	<i>Hyalopsora</i>	Borneo
26. <i>Blechnum unilaterale</i> Sw.	<i>Milesia</i>	Mexico
27. <i>Cheilanthes membranacea</i> (Davenp.) Maxon	<i>Uredinopsis</i>	Mexico
28. <i>Cheilanthes microphylla</i> Sw.	<i>Milesia</i>	Jamaica
29. <i>Cheilanthes pyramidalis</i> Fée	<i>Hyalopsora</i>	Mexico
30. <i>Cheilanthes tenuifolia</i> (Burm.) Sw.	<i>Milesia</i>	New Guinea
31. <i>Coniogramme fraxinea</i> (Don) Diels	<i>Hyalopsora</i>	China (Lat. 25° N)
32. <i>Cycloptelis semicordata</i> (Sw.) J. Sm.	<i>Desmella</i>	Trinidad
33. <i>Cystopteris fragilis</i> (L.) Bernh.	<i>Hyalopsora</i>	Mexico
34. <i>Dennstaedtia adiantoides</i> (H. & B.) Moore	<i>Milesia</i>	Cuba
35. <i>Dennstaedtia cicutaria</i> (Sw.) Moore	<i>Milesia</i>	Mexico
36. <i>Dennstaedtia dissecta</i> (Sw.) Moore	<i>Milesia</i>	Jamaica
37. <i>Dennstaedtia exaltata</i> (Kze.) Hieron.	<i>Milesia</i>	Mexico
38. <i>Dennstaedtia ordinata</i> (Kaulf.) Moore	<i>Milesia</i>	Jamaica
39. <i>Dennstaedtia rubiginosa</i> (Kaulf.) Moore*	<i>Desmella</i>	Jamaica
40. <i>Dennstaedtia rubiginosa</i> (Kaulf.) Moore*	<i>Milesia</i>	Guatemala; Jamaica; Panama
41. <i>Diplazium</i> sp. (?)	<i>Hyalopsora</i>	New Guinea
42. <i>Diplazium</i> sp. (?)	<i>Hyalopsora</i>	New Guinea
43. <i>Diplazium crenulatum</i> O. Liebm.	<i>Milesia</i>	Guatemala
44. <i>Diplazium expansum</i> Willd.	<i>Desmella</i>	Cuba
45. <i>Dryopteris</i> sp.	<i>Milesia</i>	New Guinea
46. <i>Dryopteris</i> , n. sp. (?) acc. to Maxon	<i>Milesia</i>	Jamaica
47. <i>Dryopteris boqueronensis</i> Hieron. (?)	<i>Milesia</i>	Ecuador



TABLE II (Continued)

Fern hosts	Rusts	Regional origins
48. <i>Dryopteris concinna</i> (Willd.) Kuntze <i>Milesia</i>		Guatemala; Panama
49. <i>Dryopteris dentata</i> (Forsk.) C. Chr. <i>Milesia</i>		Panama
50. <i>Dryopteris diplazioides</i> (Desv.) Urban <i>Milesia</i>		Ecuador
51. <i>Dryopteris effusa</i> (Sw.) Urban <i>Milesia</i>		Jamaica
52. <i>Dryopteris equestris</i> (Kunze) C. Chr. <i>Milesia</i>		Guatemala
53. <i>Dryopteris firma</i> (Baker) C. Chr. <i>Milesia</i>		Jamaica
54. <i>Dryopteris heteroclita</i> (Desv.) C. Chr. <i>Milesia</i>		Jamaica
55. <i>Dryopteris melanochlaena</i> C. Chr. <i>Milesia</i>		Guatemala
56. <i>Dryopteris navarrensis</i> Christ <i>Milesia</i>		Panama
57. <i>Dryopteris Nockiana</i> (Jenm.) C. Chr. <i>Milesia</i>		Jamaica
58. <i>Dryopteris oligocarpa</i> (H. & B.) Kuntze <i>Desmella</i>		Jamaica
59. <i>Dryopteris oligocarpa</i> (H. & B.) Kuntze <i>Milesia</i>		Guatemala; Jamaica; Mexico
60. <i>Dryopteris opposita</i> (Vahl) Urban (?) <i>Milesia</i>		Panama
61. <i>Dryopteris paleacea</i> (Sw.) C. Chr. <i>Milesia</i>		Guatemala; Mexico
62. <i>Dryopteris patens</i> (Sw.) Kuntze* <i>Milesia</i>		Jamaica
63. <i>Dryopteris patula</i> (Sw.) Underw. var. <i>Rossii</i> C. Chr. <i>Milesia</i>		Mexico
64. <i>Dryopteris pilosula</i> (Kl. & Karst.) Hieron. (approaches <i>D. navarrensis</i> Christ) <i>Hyalopsora</i>		Guatemala
65. <i>Dryopteris resinifera</i> (Desv.) Weatherby <i>Desmella</i>		Mexico
66. <i>Dryopteris resinifera</i> (Desv.) Weatherby <i>Milesia</i>		Guatemala
67. <i>Dryopteris rubigena</i> Maxon & Morton <i>Milesia</i>		Guatemala
68. <i>Dryopteris rudis</i> (Kze.) C. Chr. (?) <i>Milesia</i>		Guatemala
69. <i>Dryopteris Sloanii</i> (Bak.) Kuntze ( <i>D. oligophylla</i> Maxon) <i>Milesia</i>		Jamaica

TABLE II (Continued)

Fern hosts	Rusts	Regional origins
70. <i>Dryopteris Sprengelii</i> (Kaulf.) Kuntze	<i>Milesia</i>	Jamaica
71. <i>Dryopteris tetragona</i> (Sw.) Urban*	<i>Desmella</i>	Jamaica
72. <i>Elaphoglossum lingua</i> (Rad-di) Brack.	<i>Hyalopsora</i>	Jamaica
73. <i>Elaphoglossum Pringlei</i> (Davensp.) C. Chr.	<i>Milesia</i>	Mexico
74. <i>Hemionitis palmata</i> L.	<i>Milesia</i>	Jamaica
75. <i>Odontosoria Jenmanii</i> Maxon	<i>Milesia</i>	Jamaica
76. <i>Pellaea cardiomorpha</i> Weatherby	<i>Hyalopsora</i>	Mexico
77. <i>Pityrogramma sulphurea</i> (Sw.) Maxon	<i>Desmella</i>	Jamaica
78. <i>Polybotrya osmundacea</i> HBK	<i>Milesia</i>	Jamaica
79. <i>Polypodium aureum</i> L.	<i>Desmella</i>	Panama
80. <i>Polypodium ellipsoideum</i> Fée	<i>Hyalopsora</i>	Guatemala; Mexico
81. <i>Polypodium fissidens</i> Maxon	<i>Hyalopsora</i>	Guatemala
82. <i>Polypodium fissidens</i> Maxon	<i>Milesia</i>	Guatemala
83. <i>Polypodium loriceum</i> L.	<i>Desmella</i>	Jamaica
84. <i>Polypodium Martensii</i> Mett.	<i>Hyalopsora</i>	Guatemala; Mexico
85. <i>Polypodium plesiosorum</i> Kunze	<i>Uredinopsis</i>	Guatemala; Mexico
86. <i>Polypodium Veitchii</i> Bak. var. <i>glaucopsis</i> (Franch.) Ching	<i>Hyalopsora</i>	China (Lat. 26° N)
87. <i>Polystichum rachichlaena</i> Fée	<i>Milesia</i>	Guatemala
88. <i>Pteris longifolia</i> L.	<i>Milesia</i>	Jamaica
89. <i>Pteris longifolia</i> L.	<i>Desmella</i>	Jamaica
90. <i>Pteris quadriaurita</i> Retz.	<i>Milesia</i>	Panama
91. <i>Pteris quadriaurita</i> Retz.	<i>Desmella</i>	Jamaica
92. <i>Tectaria irregularis</i> (Pr.) Copeland (?)	<i>Milesia</i>	New Guinea
93. <i>Woodsia mollis</i> (Kaulf.) J. Sm.	<i>Hyalopsora</i>	Mexico

## SUMMARY AND COMMENTS

1. Rusts are recorded for the first time as occurring in the Ophioglossaceae and Cyatheaceae. To these may possibly be added the Gleicheniaceae.

2. *Hyalopsora* rusts are recorded for the first time as occurring in the Ophioglossaceae and Cyatheaceae.

3. *Milesia* rusts are correctly recorded for the first time as occurring in the Schizaeaceae and Cyatheaceae. To these may possibly be added the Gleicheniaceae.

4. Species of the following fern genera, found growing within the tropics, are recorded in this paper as:

(a) hosts for DESMELLA rusts: *Adiantum* (1), *Anemia* (4), *Blechnum* (1), *Cyclopeltis* (1), *Dennstaedtia* (1), *Diplazium* (1), *Dryopteris* (5), *Pityrogramma* (2), "Polypodiaceae" (1), *Polypodium* (2), *Pteris* (2);

(b) hosts for HYALOPSORA rusts: *Adiantum* (2), *Anogramma* (1), *Antrophyum* (1), *Asplenium* (1), *Athyrium* (2), *Blechnum* (1), *Botrychium* (1), *Cheilanthes* (1), *Coniogramme* (1), *Cyathea* (1), *Cystopteris* (1), *Diplazium* (2), *Dryopteris* (1), *Elaphoglossum* (2), *Pellaea* (2), *Polypodium* (4), *Woodsia* (1);

(c) hosts for MILESIA rusts: *Anemia* (1), *Asplenium* (1), *Athyrium* (1), *Blechnum* (4), *Cheilanthes* (2), *Coniogramme* (1), *Cyathea* (3), *Dennstaedtia* (6), *Diplazium* (1), *Dryopteris* (26), *Elaphoglossum* (1), *Gleichenia* ? (1), *Hemionitis* (1), *Nephrolepis* (3), *Onychium* (1), *Odontosoria* (1), *Pellaea* (1), *Polybotryum* (1), *Polypodium* (2), *Polystichum* (2), *Pteris* (2), *Tectaria* (1);

(d) hosts for UREDINOPSIS rusts: *Adiantum* (1), *Anogramma* (1), *Asplenium* (1), *Athyrium* (1), *Blechnum* (1), *Cheilanthes* (2), *Cystopteris* (1), *Pellaea* (1), *Polypodium* (1), *Pteridium* (including under *P. aquilinum* its varieties and marginal species).

The names in black face are genera within the tropics recorded for the first time as hosts for rust fungi. The numbers of species reported for each genus are indicated in parentheses.

5. *Desmella* is reported in this paper on 21 fern host species collected within the tropics, *Hyalopsora* on 24 species, *Milesia* on 63 species, *Uredinopsis* on 10 species, *Puccinia* on one species, and *Uredo* on 4 species. The paper lists a total of 109 tropical fern species (exclusive of varieties, etc.) known to be hosts of rust fungi; of these 73 are recorded for the first time.

6. I have found 25 rusted fern host species in Guatemala, 27 in Jamaica, 27 in tropical Mexico and 9 in Panama. Hashioka, in collections made both north and south of the Tropic of Cancer, reported 16 from Formosa (as published by Hiratsuka & Hashioka in their "Uredinales collected in Formosa"). Varieties are not included in any of these numbers, nor are the submarginal species of *Pteridium aquilinum*.

7. According to my experience, rusted ferns in the tropics are rarely found below an elevation of about 2000 feet above sea level. *Uredo* rust on *Lygodium* is exceptional; I collected it at sea level around Puerto Barrios in Guatemala. I could find no fern rusts on Barro Colorado Island, Panama Canal Zone; the greatest elevation on that island is said to be under 550 feet.

8. Much is to be expected from the vast mountainous regions extending eastward from Iran (Persia) to the South China Sea, from which have



come scant collections only, and these from very limited northern areas, probably in reality extratropical, such as around Kunming, Yunnan, China.

9. Comprehensive data based on old and new records embodied in fern rust collections from the tropics are summarized in Table III. This table designates all the relevant fern genera hosts, the numbers of their affected species, the involved rust genera for each fern genus, and the regions in which the collections were made.

TABLE III  
FERN RUST HOST GENERA IN THE TROPICS AND THEIR DISTRIBUTION

	<i>Desmella</i>	<i>Hyalopsora</i>	<i>Milesia</i>	<i>Uredinopsis</i>
<i>Adiantum</i>	4 <sup>a</sup> Trinidad 1 <sup>a</sup>	Mexico 1; Brazil 1	_____	Guatemala 1
<i>Anemia</i>	4 Brazil 3; Jam. 1; Mex. 1	_____	Jamaica 1; Mexico 1	_____
<i>Anogramma</i>	1 _____	Mexico 1	_____	Mexico 1
<i>Antrophyum</i>	1 _____	Dom. Rep. 1; Porto Rico 1	_____	_____
<i>Asplenium</i>	2 _____	Guatemala 1; Mexico 1	New Guinea 1	_____
<i>Athyrium</i>	4 _____	Mexico 2; New Guinea 1	Mexico 1	Guatemala 1; Mexico 1
<i>Blechnum</i>	6 Brazil 1	Borneo 1	New Guinea 1 <sup>b</sup> ; Trop. Am. <sup>c</sup> 1, 1, 3	Colombia 1
<i>Cheilanthes</i>	4 _____	Mexico 1	Jamaica 1; New Guinea 1	Mexico 1, 1
<i>Coniogramme</i>	1 _____	_____	Formosa 1	_____
<i>Cyathea</i>	4 _____	New Guinea 1	Guatemala 1; Jamaica 1; Mexico 1	_____
<i>Cyclopheltis</i>	1 Trinidad 1	_____	_____	_____
<i>Cystopteris</i>	1 _____	Mexico 1	_____	Mexico 1
<i>Dennstaedtia</i>	6 Jamaica 1; Porto Rico 1	_____	Colombia 1; Cuba 1; Guatemala 1; Jamaica 3; Mexico 2; Panama 1	_____
<i>Diplazium</i>	4 Cuba 1	New Guinea 2	Guatemala 1	_____

<sup>a</sup> The numerals indicate the number of host species involved. Those in black face are new records.

<sup>b</sup> This might be a *Hyalopsora*.

<sup>c</sup> Colombia 2, Costa Rica 1, Cuba 1, Ecuador 1, Guatemala 1, Jamaica 1, Mexico 2, Panama 1, Porto Rico 1, Venezuela 2.

TABLE III (Continued)

		<i>Desmella</i>	<i>Hyalopsora</i>	<i>Milesia</i>	<i>Uredinopsis</i>
<i>Dryopteris</i>	29	Jamaica 2; Mexico 1; Porto Rico 3; Venezuela 2	Guatemala 1	Ecuador 1, 2; Formosa 2; Guatemala 8; Jamaica 1, 9; Mexico 3; New Guinea 1; Panama 4	—
<i>Elaphoglossum</i>	4	—	Colombia 1; Jamaica 1, 1	Mexico 1	—
<i>Gleichenia</i> (?)	1	—	—	New Guinea 1	—
<i>Hemionitis</i>	1	—	—	Jamaica 1	—
<i>Lygodium</i>	4 <sup>a</sup>	—	—	—	—
<i>Nephrolepis</i>	3	—	—	Colombia 1; Phil. Islands 1; Porto Rico 1	—
<i>Odontosoria</i>	1	—	—	Jamaica 1	—
<i>Onychium</i>	1	—	—	Phil. Islands 1	—
<i>Pellaea</i>	3	—	Ecuador 1; Mexico 1	Madagascar 1	Mexico 1
<i>Pityrogramma</i>	2	Ecuador 1; Jamaica 1; Venezuela 1	—	—	—
<i>Polybotrya</i>	1	—	—	Jamaica 1	—
" <i>Polypodiacea</i> "	1	Ecuador 1	—	—	—
<i>Polypodium</i>	7	Jamaica 1; Panama 1	Guatemala 3; Mexico 2	Formosa 1	Guatemala 1; Mexico 1
<i>Polystichum</i>	2	—	—	Formosa 1; Guatemala 1	—
<i>Pteridium</i>	—	—	—	—	Almost world-wide
<i>Pteris</i>	2	Jamaica 2	—	Jamaica 1; Panama 1	—
<i>Tectaria</i>	1	—	—	New Guinea 1	—
<i>Woodsia</i>	1	—	Mexico 1	—	—

<sup>a</sup> Brazil 2; Br. Guiana 1; Guatemala 1; San Salvador 1; Trinidad 1; Venezuela 1. The rusts involved are referred to the genera *Uredo* and *Puccinia* in Tables I and II.

ARNOLD ARBORETUM,  
HARVARD UNIVERSITY.

## SPECIES NOVAE FAGACEARUM SINICARUM

WOON-YOUNG CHUN AND YING TSIANG

THE MATERIAL on which this paper is based is part of an extensive collection made between the winter of 1942 and the summer of 1945 under the direction of the junior author. When the situation in Hongkong, where the Botanical Institute was temporarily stationed, became critical, Professor Tsiang led a part of our staff to northern Kwangtung to contact the main body of the University. The attack on Hongkong commenced while the party was enroute. In the winter of 1942 a Branch Institute was established at Li Yuan Po in southern Hunan, and from this new center, botanical explorations in southern Hunan, northern Kwangtung, and the Shih-Wan-Ta Shan region bordering Kwangtung and Kwangsi continued throughout the four years of the Pacific War.

As a result of unremittent labor under difficulties needless to detail, nearly 10,000 numbers totalling over 100,000 specimens, have been collected. This large collection is now available to specialists and botanical institutions throughout the world.

Pending the reissue of our Journal *Sunyatsenia*, this paper is submitted to the *Journal of the Arnold Arboretum* for publication to mark the resumption of normal relations between our two institutions.

The types of the new species here-in described are preserved in the herbarium of the Botanical Institute, Sun Yatsen University; duplicate types in the herbarium of the Arnold Arboretum.

**Lithocarpus Chifui** Chun et Tsiang, sp. nov.

Arbor 12 m. alta et trunco (e notis collectoris) ad 75 cm. diametro; ramuli mediocriter robusti teretes glabrati, in sicco fusco-nigri lenticellis paucis magnis discoloribus notati anno secundo vix dissimiles; gemmae terminales solitariae vel aggregatae, proportione parvae, 3-4 mm. longae, subglobosae vel ovoideo-obtusae perulis ovatis breviter acuminatis rubescentibus lucidis dorso carinatis margine ciliolatis obtectae. Folia ut videtur per duos annos persistentia, firme coriacea glaberrima oblongo-lanceolata vel oblongo-oblancoolata, apice late acuta, basi saepe oblique cuneata in petiolum robustum paulo producta rarius fere rotunda et in petiolum abrupte contracta, supra atro-viridia subtus cinereo-viridia (teste collectore) siccitate flavescentia, margine integra saepe late undulata, magnitudine in eodem ramulo satis variabilia, minora plerumque ad 15 m. longa et 5 cm. lata, majora 25 cm. longa et 12 cm. lata, costa media supra valde elevata infra medium canaliculata, basin versus circiter 1.2 mm. lata, costa nervisque subtus distincte elevatis lateralibus a costa angulo 25°-30° ab illa divergentibus utrinsecus 10 vel 11 inter se satis distantibus patenti-curvatis ante marginem vix prominente arcuato-anastomosantibus trabeculis transversis subparallelis sparsis sub lente crebre



foveolato-reticulatis conjunctis; petiolus basi turgidus supra late sulcatus glaber, vix ultra 1.5 cm. longus. Flores ♂ desunt. Flores ♀ (post anthesin) quini-aggregati, unicus tantum maturans, 4 alii abortivi, glomeris inter se distantibus plerisque haud maturatis; lamellae 4-5 concentricae tenues erosae obscure griseo-puberulae. Fructus biennes secus pedunculum validum erectum nigrum parce lenticellatum ad 17 cm. longum proventu in exemplo viso 7-8 sessiles contigui unilaterales bifariam divergentes; cupula globosa circiter 2 cm. diametro, stylopodio excepto totam glandem includens, tenuis extus undique griseo-lepidotis, zonis 3-4 concentricis inaequaliter distantibus sinuato-undulatis inferioribus subintegris superioribus lacerato-dentatis triangularibus tenuibus ornata. Glans apice excepta cum cupula concrescens depresso globosa vertice complanata basi rotundata glabra pallida subnitida, longitudinaliter rugulosa pericarpio lignoso 2-2.5 mm. crasso; intus esepata, semen pentagonum.

KWANGTUNG: Yu Yuen Hsien, Mo-Fung Shan, tree 12 m. tall,  $\frac{3}{4}$  m. in diameter, leaves dull green above, gray green beneath, Nov. 19, 1933, *S. P. Ko* 53679.

This new species may be compared with *Lithocarpus megastachya* Hick. et A. Camus from which it is amply distinct by isolated, not ternately coalescent acorns. The pistillate inflorescence of our new species, as deduced from the fruiting state, shows some interesting features. The flowers are clustered in 5's in more or less pentagonal groups, but all those on the under side of the rhachis remain abortive, and of those more advantageously placed in relation to light, only one in each cluster reaches maturity. The individual flowers are contiguous but not confluent. The ripe acorns are alternately juxtaposed in two ranks all facing one direction.

This outstanding species is named after Dr. W. P. Fang, Professor of Botany in the National University of Szechuan in recognition of his exhaustive researches on the flora of Omei Shan, and in appreciation of the cooperative spirit dominating his associations with the authors.

*Lithocarpus chrysocoma* Chun et Tsiang, sp. nov.

Arbor usque ad 12 m. alta, trunco 50 cm. diametro coma late ovoidea, partibus juvenilibus inflorescentiisque ac fructibus dense et molliter tomentosis, cortice in lamellas irregulares profunde fisso, ramis vix patentibus ramulis robustis angulatis junioribus molliter fulvido-tomentosis cito sordide flavescenti-tomentosis vetustioribus glabrescentibus. Gemmae ovoideae vel rotundatae obtusae, circiter 2 mm. longae, perulis ovalis rubro-brunneis lucidis dorso glabris ceterum pilosis. Folia triennia coriacea, supra olivacea nitida annotina opaca praeter costae partem inferiorem sordide puberulam glaberrima, subtus densissime aureo- in sicco ochraceo-farinosa vel pulverulenti-lepidotula, elliptico- vel lanceolato-oblonga apice abrupte falcatis breviter caudato-acuminata, basi inaequaliter cuneata, margine integerrima subtiliter revoluta, 7-10 cm. longa et 3-4 cm. lata, maxima  $16 \times 6.5$  cm., costa nervisque supra subimpressis subtus elevatis lateralibus in utroque latere 9-10 interdum 12 sursum leviter curvatis ante marginem evanescentibus venulis oblitteratis, petiolis molliter sordide tomentosis, supra leviter sulcatis, 1-1.5 mm. longis. Amenta mascula in apicibus ramulorum hornotinorum conspersa et ex axillis foliorum sum-

morum paniculata rhachidibus angulatis dense fulvido-tomentosis 3–9 cm. longis, floribus fasciculatis, perianthii lobis membranaceis rubro-purpurascentibus extus tomentosis ovatis concavis circiter 1 mm. longis, staminibus longe exsertis 1.5–2 mm. longis, filamentis glabris filiformibus, antheris globosis; spicae femineae solitariae in axillis foliorum superiorum aggregatae, 3.5 cm. longae; florum fasciculi ad axem crassiusculam dense tomentosam conspersi sessiles 3–6-flori; flores (juvenales non visi) perulis numerosis arcte imbricatis tomentosis; styli 3 glabri divaricati. Fructus biennes 2–3 aggregati inferne confluentes sessiles turbinato-subglobosi; cupula tenuiter lignosa, circiter 1.5 cm. alta et 2 cm. diametro, extus fulvido-tomentosa intus adpresse sericeo-pilosa; squamae multiseriatae deorsum confluentes apicibus acuminatis liberis falcatis; glans praeter apicem planam vel leviter curvatam medio umbonatum inclusa depresso globosa vel hemisphaerica sericeo-puberula, basi cupula solum concreta, pericarpio usque 1.8 cm. crasso; stigmatibus deciduis; cicatrix alta convexa circiter 18 mm. lata.

KWANGTUNG: Yu-Yuen Hsien, Ching-Chi Tung, tree 6–8 m. tall, July 1933, *S. P. Ko* 52839, 52842, 52992, 52933; same district, Shang-Yuen Shan, July 1933, *S. P. Ko* 53060; Mo-Fung, Nov. 1933, *S. P. Ko* 53686; Yu-Yuen Hsien, Chine-Chi Tung, Aug. 31, 1935, *Z. S. Chung* 10957 (TYPE); same locality, Oct. 1936, *Y. Li* 2059.

KWANGSI: Without data, No. 5977 (*B. I. Herb. No.* 38776). HUNAN: I-Chang, Mang Shan, tree 7 m. tall, Oct. 1942, *P. H. Liang* 83704, 83811, 83853; same locality, Oct. 1942, *S. H. Chun* 2720.

This new species is easily distinguished from its nearest allies, *L. amygdalifolia* (Skan) Schottky and *L. dealbata* (Hook.f. et Th.) Rehd. by the golden to reddish yellow pulverulent indumentum on the under-surface of the leaves.

*Lithocarpus Paihengii* Chun et Tsiang, sp. nov.

Arbor ad 12 m. alta trunco 22 cm. diametro cortice cinereo-brunnei in lamellas irregulares fisso; ramuli annotini validi angulati profunde sulcati in sicco nigrescentes hornotini crassissimi cylindrici sordide nigrescentes lenticellis satis conspicuis discoloribus conspersi; gemmae magnae obtuse ovatae, 10–12 mm. longae, perulis exterioribus late ovato-rotundatis flavido- vel fulvo-brunneis glabris interioribus albo-sericeis obtectae. Folia persistentia valde coriacea rigida plana oblongo-lanceolata, 15–20 cm. longa, 5–8 cm. lata, apice subito in acumen latum falcatum acutum breviter acuminata, basi late cuneata plerumque in petiolum quasi-alatum decurrentia, supra intense viridia lucida subtus pallidiora vel albescentia (e collectore) initio dense indumento fulvo-furfuraceo-pulverulento anno secundo saepe plus minus evanescente obtecta, costa media utrinque elevata supra dimidio inferiore sulcata subtus et nervi ochrascentes, nervis utrinsecus 8–10 sub angulo 50° divergentibus obliquis curvatis nonnulla furcatis versus marginem indistincte anastomosantibus; trabeculae transversae subtus tantum tenuiter prominulae; petiolus complanatus, 2.5–3 cm. longus. Fructus biennes in rhachidibus validis nigris lenticellatis 2.5–5 cm. longis 2-vel 3-ni glomeratis glomerulis inferne coalescentibus sessilibus; cupula depresso globosa, tenuiter lignosa, 2–2.5 cm. diametro, ore 10–14 mm. diam., fere totam glandem obvoluta sed basin tantum glandem adhaerens, intus densissime et brevissime albo-tomentosa, squamis conspicuis crassis imbricatis deltoideis apicibus liberis, inferne flavo-cinereo-tomentosis

superne glabrescentibus; glans depressa globosa, 18 mm. lata, 15 mm. alta, castanea nitida minute albedo-furfuracea parte superiore detergente plana vel subrotundata apiculata; cicatrix basilaris valde convexa albida rugulosa, 15 mm. diametro; nucula subpentagona, obtuse 5-costata.

HUNAN: I-Chang Hsien, Chin-Chuan Village, Cha Shan, alt. 930 m., tree 6 m. tall, on slope of sparsely wooded ravine, leaves whitish green beneath Sept. 25, 1942, *P. H. Liang* 63698; same locality, tree 12 m. tall, 22 cm. diam., bark gray brown peeling off in plates, young leaves brownish beneath, Sept. 26, 1942, *P. H. Liang* 83729.

This new species is most closely related to *Lithocarpus cleistocarpa* (Seemen) Rehd. et Wilson from which it differs in thicker coriaceous leaves with a fulvous furfuraceous indumentum on the undersurface which persists more or less into the second year, and especially in the very different fruits. In *L. cleistocarpa* the acorn is completely adnate to the cupule excepting the exposed apex, while in this new species, it adheres to the involucre only at the base.

The wood is hard and durable and is highly valued at least locally for making carrying poles.

It affords us unusual pleasure to associate this handsome and useful tree with the name of Professor W. C. Cheng, a dendrologist of outstanding achievements.

*Quercus dispar* Chun et Tsiang, sp. nov.

Arbor 8–16 m. alta partibus juvenilibus dense griseo-flavido tomentosis; ramuli tenuisculi teretes grisei serius glabrescentes lenticellis sparsis vix conspicue notati. Folia persistentia biennia tenuiter coriacea elliptico-oblonga vel obovato-lanceolata, absque petiolo 8–10 cm. longa  $\pm$  3 cm. lata, apice breviter lateque falcato-acuminata vel -acuta, basi obtusa vel cuneata, margine e tertio infero raro e medio crenato-dentata dentibus callosio-mucronatis, supra intense viridia praeter costam medium planam sordide puberulam glabra, subtus maturitate fulvescentia ubique sparse in costa nervisque dense fasciculato-pilosula, costa tenui nervis lateralibus utrinsecus 10–13 porrecto-ascendentibus inferioribus procul a margine dissolutis ceterum ad serratulas procurrentibus omnes cum venulis subtransversis subtus tantum tenuiter prominulis conjunctis; petiolus 8–10 mm. longus sordide fusco-pilosulus; stipulae chartaceae ellipticae acutae, 5 mm. longae, 1.5 mm. latae, extus puberulae. Inflorescentiae non satis evolutae. Fructus sessiles solitarii in autumnio secundo maturi. Cupula pateriformis, basi plana, tertiam partem glandis amplexans, ad 3 cm. diametro, 0.8 cm. alto, intus minute sericeo-pilosula extus flavido-griseo tomentosa, concentrice zonata annulis circiter 10 tenuibus infimis grosse erosis supremis integris. Glans depressa globosa vel disciformi-subhemisphaerica, 2.8–3 cm. lata 1.2–1.5 cm. alta, plus minusve dense puberula, apice plana umbonata, basi truncata; cicatrix plana rugulosa, 16 mm. diam.

KWANGSI: Shang-Si Hsien, Shih-Wan-Ta Shan, Feng-Hwang Hsiang, shrub 8 m. tall, in sparsely wooded ravine on wet sites beside stream, branchlets pale gray, leaves deep green above, pale green beneath, young inflorescences white, March 3, 1944, *S. H. Chun* 4659.



This species is related to *Quercus vestita* Rehder et Wilson from which it differs in indumentum, smaller differently shaped leaves with much more regular venations, and sessile deeper cup with more numerous annular rings. *Quercus Dussaudii* Hick. et A. Camus which has similar fruits, besides being glabrous, differs in having an acorn with a deeply intruded basal scar.

*Quercus delicatula* Chun et Tsiang, sp. nov.

Arbor 13 m. alta fructu excepto glaberrima, cortice ramulorum fere laevi pallido-brunneo (e collectore) mox purpureo- vel fusco-nigro; ramuli annotini tenerrimi obscure angulati sulcatique vetustiores teretes omnes lenticellis parvis sparsis obtecti. Gemmae ovatae obtusae brunneae, vix ultra 2 mm. longae. Folia chartacea, per duos annos persistentia petiolata elliptica vel elliptico-lanceolata, apice breviter caudato-acuminata, basi inaequaliter cuneata, toto margine integerrima exsiccando tantum leviter undulata, 4–6.5 cm. longa, 2–2.5 cm. lata, fere concoloria, supra atroviridia nitidula, subtus leviter tantum pallidiora opaca, costa nervisque tenuibus supra cum trabeculis crebre reticulatis planiusculis vix conspicuis inferne manifeste elevatis haud venulosis nervis utrinsecus 7–8 patenti-ascendentibus ad marginem arcuatis obscure confluentibus; petioli graciles superne sulcati, circiter 1 cm. longi. Flores ignoti. Fructus biennes in axillis foliorum superiorum solitarii pedicellis cum pedunculis 1–1.5 cm. longis stipitati; cupula cupuliformis, 8–11 mm. alta, 14–18 mm. diametro, tenuis sed firma, intus adpresse fulvo-sericeo-pilosa; annulis 6–7 tenuibus erosulis sursum atrobrunneis striatis glabrescentibus deorsum dense griseo-tomentosis; glans pro maxima parte exserta elliptico-oblonga apiculata, symmetrica vel saepe sursum plus minusve oblique curvata, atrocastanea lucida, 2–2.5 cm. longa et 1–1.5 cm. diametro, apice basique adpresse puberula; cicatrix plana, 5–6 mm. diam.

KWANGTUNG: Cheng Hsien, Shih-Wan-Ta Shan, tree 13 m. tall, scattered in mixed forest in dense shade, fruits light yellow, Dec. 19, 1943, *S. H. Chun* 3990.

This new species is characterized by delicate, glabrous vegetative parts, thin, relatively small, entire, caudate-acuminate subconcolorous leaves, and a small cupule with the upper half of the annular rings glabrescent and the lower half densely tomentose. It is not likely to be confused with any of the described Chinese or Indo-Chinese species.

*Quercus disciformis* Chun et Tsiang, sp. nov.

Arbor vulgo 10–14 m. alta (usque ad 40 m. alta et 1 m. diametro fide Wang), cortice irregulariter fisso, ramulis hornotinis sordide flavescenti-pubescentibus annotinis vetustioribusque glabrescentibus atro-corticatis minute striatis. Folia ut videtur per duos annos persistentia subcoriacea in ambitu magnitudineque satis variabilia elliptico-oblonga obovato-oblonga, vel plus minusve oblanceolata, minima 6 cm. longa et 2.5 cm. lata, maxima 13 cm. longa et 4.5 cm. lata, basi obtusa late cuneata vel subrotunda, apice in caudam angustam falcata acutam 1–1.5 cm. longam  $\pm$  subito attenuata margine supra basin vel dimidio superiore sinuato-dentata dentibus grossis incurvis calloso-apiculatis, supra olivacea subtus pallidiora in sicco utrinque brunnescentia, costa supra leviter impressa subtus elevata

nervis utrinsecus 11–13 tenuibus sensim curvatis in dentes excurrentibus venis subtransversis crebris subtus tantum prominulis, petiolis teretibus gracilibus calvis circiter 2 cm. longis. Gemmae oblongo-ovoideae acutae, 5–8 mm. longae, perulis ovatis obtusis rubro-brunneis, interioribus adpressis puberulis. Flores masculi desunt; feminei (juvenilibus ignotis) foliorum superiorum axillis 2–5 breviter spicati sessiles, pedunculo erecto tomentoso 1–2.5 cm. longo, ovario ovoideo, stigmatibus alte 3-fidis divaricatis glabris. Fructus biennes sessiles, in rhachidibus abbreviatis singuli vel raro gemini et inter se aversi cupula basi glandem tantum sustinens nullo modo amplexens plano-disciformis, 3–4 cm. diametro margine plano vel passim decurvo, intus dense molliter fulvo-sericeo-velutina, extus lamellis concentricis 8–9 tenuibus fulvo-tomentosis argute eroso-dentatis supremis integerrimis ornata; glans (e typo) 0.8 cm. alta, 3 cm. diametro, discoidea, apice impressa dense adpresse sericeo-tomentosa stylopodio valido conico truncato coronata; cicatrix concava glabra, circiter 2 cm. diametro.

KWANGTUNG: Hsin-I Hsien, Ling-Tung Pao, Chung-Tung, tree in mixed woods, leaves pale green beneath, Aug. 3, 1931, *C. Wang* 31087 (TYPE); same locality, tree 10 m. tall in edge of woods, fruit immature, Aug. 3, 1931, *S. P. Ko* 51729; Yun-Fou Hsien, without precise locality, Sept. 12, 1928, *S. S. Sin* No. 5160 (*Bot. Inst. Herb. No. 136531*); same district, Yun-Mu Shan, Lan-Kang, tree 40 m. tall, 1 m. diam. in community woods, cupule and acorn green, Nov. 17, 1934, *C. Wang* 37392. HAINAN: Pai-Sha Hsien, Fon-Ta Chuen, tree 9 m. tall, in dense woods, April 19, 1936, *S. K. Lau* 26333. KWANGSI: Shang-Hsi Hsien, Shi-Wan-Ta Shan, Tung-An Hsiang, tree 19 m. tall, in forested ravine side of stream, branchlets blackish brown, fruits pale brown, Feb. 3, 1944, *S. H. Chun* 4492.

This new species is distinguished from all other species known to us by the thin flat broad involucre, velvety tomentose inside (excepting the basal scar) supporting, but not at all embracing, a slightly narrower more or less depressed acorn. The acorns as described are evidently immature, those collected later in the season are fully 1.5 cm. long and uniformly hemispheric. In most specimens the fruits are solitary but in others they are borne, back to back, in pairs from the same level on opposite sides of a short spike.

*Quercus Paohanii* Chun et Tsiang, sp. nov.

Arbor ramosissima usque ad 15 m. alta fructu et partibus junioribus floribusque exceptis glaberrima, coma umbraculiformi, ramis ramulisque gracilibus; cortex griseus profunde et irregulariter fissus; ramuli hornotini angulati atrobrunnei sparse pilosi annotini vetustioresque teretes pallidiores glabrescentes conspicue lenticellati. Gemmae oblongo-ovoideae compressae acuminatissimae perulis ovatis obtusis biserialibus ciliatis. Folia tenuiter coriacea per duos annos persistentia elliptico- vel lanceolato-ovata raro lanceolata in caudam angustam acuminatissimam 1.5–2 cm. longam sensim attenuata, basi late inaequaliter cuneata vel in maxima fere rotundata, margine subtiliter revoluta integerrima vel saepe in adulta remote serrulata dentibus obtusis recurvis, supra nitidula subtus pallidiora, 5–8 cm. longa et 1.5–2 cm. lata (maxima 10 × 3 cm.), costa nervisque supra applanatis vel paulo impressis subtus costa prominenti et lateralibus utrinsecus 10–12 ante marginem furcatis petioli 4–6 mm. raro usque 10 mm. longi. Stipulae caducissimae subulatae longe pilosae circiter 1 cm.

longae. Amenta mascula subpendula in axillis foliorum vel bractearum solitaria 5–6 raro-7 cm. longa rhachis parce pilosa angulata; flores singuli sessiles, perianthii lobis 5 membranaceis brunneis ovatis albo-pilosis ciliatis 1 mm. longis; stamina exserta antheris ovoideis filamenta subaequilongis circiter 0.5 mm. longis. Flores feminei spicati in axillis foliorum solitarii, pedunculo 3–7 mm. longo, stigmata ad 1 mm. longa crassiuscula divaricata. Fructus biennes sessiles subglobosi vel oblongo-ovoidei; cupula semiglobosa 1 cm. diametro intus dense cinereo-tomentosa, squamis permultis imbricatis ovatis cinereo-tomentosis apicibus glandulosis; glans subglobosa 1 cm. longa et 6 mm. diametro apice puberula, stigmatibus subcapitatis deciduis.

KWANTUNG: Yu-Yuen, Hsien, Wu-Yang Shih, tree in woods, Nov. 19, 1940, *P. H. Liang* 532 (TYPE); Tung-Shui Ts'ung, tree 5 m. tall, Jan. 8, 1941, *P. H. Liang* 83015. HUNAN: I-chang Hsien, Li-Yuan-Pao, in light woods, April 8, 1942, *S. H. Chun* 2099; same locality, Nov. 10, 1943, *S. H. Chun* 2946; tree 12 m. tall, flowers greenish, March 25, 1943, *S. H. Chun* 2977. Kiangsi: Without precise locality, April-May 1942, *S. M. Mu* 21138.

This evergreen oak with unusually small acorns is very common in the vicinity of Li-Yuan Pao, I-chang Hsien, S. Hunan where a branch of the Botanical Institute was established throughout the war. It thrives from level-land up to an altitude of 1000 m., intermixed with deciduous species and conifers. Its range extends from the northern part of Yu-Yuan District in Kwangtung province to the foot of Mang Shan, the famous region in southern Hunan where virgin forests still exist. The edible acorns of this tree, colloquially called Chui-li, are sold in local markets. The wood is fine and durable, much used by the natives for making furniture and handles of various kinds of tools. It is especially good for preparing charcoal.

This graceful oak which no doubt will become a common ornament in local and foreign gardens is named after the collector, Mr. Pao-Han Liang, Lecturer in Botany of this Institute.

*Quercus bella* Chun et Tsiang, sp. nov.

Arbor 9 m. alta dense ramosa confertifolia (e collectore) fere omnino glabra ramis ramulisque gracillimis minute lenticellatis ultimis angulatis fuscis vetustioribus subteretibus nigro-corticatis. Folia per duos annos persistentia crasse membranacea lanceolata absque petiolo 7–13 cm. longa 2.5–3.5 cm. lata, apice sensim acuteque acuminata, basi attenuata e medio sursum crenato-dentata dentibus utroque latere plerumque 9 callosio-apiculatis, supra atroviridia nitidissima costa nervis venulisque planis leviter tantum prominulis subtus laete viridia opaca nervis lateralibus primariis 14–16 ascendentibus fere rectis inferioribus versus marginem curvatis superioribus in dentibus exeuntibus atque costa elevata prominentibus venulis transversis tenuissimis crebre connexis, petiolis tenuibus 5–10 mm. longis. Flos masculinus ignotus. Flores feminei ad apicem pedunculi gemini sessiles pedunculo in axillas foliorum superiorum solitario erecto quam petiolo brevior circ. 12 mm. longo; bractee sub flore 3 valde inaequales, majora semi-circularis, omnes dorso pilosulae; perianthium urceolatum extus deorsum glabrum vertice annulatum adpresse denseque sericeo-pilosum; styli 4 robusti apice in stigmatem crassum capitatum



lobulatum abrupte dilatati. Fructus ut videtur triennis solitarius sessilis; cupula pateriformis fere plana tantum tenuiter marginata 5 mm. alta 3 cm. lata glande paulo latior, intus adpresse fulvo-pilosa centro umbilico convexo circ. 16 mm. lato conspicue notata, extus atrata glabrescens concentricè annulata annulis 7 laxis levibus planis inferioribus latis grosse irregulariter erosis marginalibus 2 vel 3 angustissimis multo proprioribus integris; glans depresso hemisphaerica basi cupulae solum adnata, 1.6–1.8 cm. alta 2.5–2.8 cm. lata, atrocastanea adulta glabrata apice umbone conico circumcirca annulato obscure puberulo coronata; cicatrix margine gradatim curvata concava usque ad 16 mm. lata.

KWANGTUNG: Fang-Cheng Hsien, Shi-Wan-Ta Shan, alt. 200–250 m., shrubby tree in sparsely wooded ravine along stream on moist sites, branchlets blackish, leaves deep green above, light green beneath, dry fruits brown, Mar. 24, 1944, *S. H. Chun* 4772.

Differs from *Q. Dussaudii* Hick. et A. Camus in the dentate leaves with more numerous lateral veins and the shallow cup only supporting, not at all enclosing the acorn. According to the collector, this oak is suitable for carpentry. The felled logs left *in situ* are used for the culture of edible mushrooms. This tree has ornamental qualities which recommend it for landscape planting.

BOTANICAL INSTITUTE,  
SUN YATSEN UNIVERSITY,  
CANTON, CHINA.

## NOTES ON CHINESE STERCULIACEAE

WOON-YOUNG CHUN AND HSIANG-HAO HSUE

*Sterculia subracemosa* Chun et Hsue, sp. nov.

Frutex parvus ramulis juvenilibus gracilibus sparse stellato-tomentosis. sicco striatis rubro-brunneis. Folia subcoriacea obovato-oblonga, 11–18 cm. longa, 4–6.5 cm. lata, apice obtusa vel acutiuscula, basi acuta vel cuneata, utraque pagina glabra, nervis primariis lateralibus utrinsecus 8–10 ascendentibus inter se anastomosantibus cum venulis utrinque valde prominentibus; petiolus 1.5–2.5 cm. longus, apice basique incrassatus, initio dense stellato-tomentosus deinde glabrescens. Inflorescentia subracemosa, plus minusve pendula, gracillima, usque ad 10 cm. longa, dense rufo-stellato-tomentosa, pedicellis ultimis 8–10 mm. longis, articulatis, bracteolis lineari-lanceolatis, acutis, 2 mm. longis, tomentosis. Flores ♂ ignoti; perfecti albi, roseo-tincti; calyx 13 mm. longus 5-lobatus extus pubescens intus praeter partem superiorem loborum glaber, lobis ovato-lanceolatis tubo campanulato subaequantibus vel leviter longioribus, margine ciliolatis; antherae 17 (an semper?) prope basin ovarii aggregatae, biloculares, connectivo incrassato; ovarium globosum oviciter 1.5 mm. diam. dense pubescens gynophoro 2.5 mm. longo puberulo; stylus 1 mm. longus pubescens, stigma 5-lobata. Fructus ignotus.

KWANGTUNG: Hsin-I District, Tung-Kang, small shrub along stream, flowers white, tinged pink, March 21, 1932, *C. Wang* 31738\*.

This species is allied to *Sterculia lanceaefolia* Roxb., differing in the obovate leaves and pale flowers. In certain characters it approaches *S. hainanensis* Merr. et Chun, but the obovate-oblong leaves and larger flowers are obviously different from those of the latter species.

*Sterculia micrantha* Chun et Hsue, sp. nov.

Arbor 7 metralis, ramis ramulisque medulla ampla alba spongiosa repletis; ramuli validi teretes foliorum delapsorum cicatricibus magnis lenticellisque sparsis brunneis notati, siccitate rubro-brunnei valde striati. Folia non satis matura elliptico-oblonga, tenuiter chartacea, 7–14 cm. longa, 3.5–6.5 cm. lata, apice obtusa vel abrupte acuta, basi late cuneata, supra glabrescentia, subtus ad costam venasque sparse stellato-tomentosa, costa valida nervis primariis lateralibus utrinque 12, patenti-ascendentibus subtus prominentibus; petiolus 3–8 cm. longus, sparsissime stellato-tomentosus; stipulae lineari-lanceolatae, 10–12 mm. longae, tomentosae. Inflorescentia paniculata, gracilis, usque ad 26 cm. longa, multiflora; pedicelli ultimi filiformes 3–4 mm. longi, articulati, leviter tomentosi; calyx albus, tenuis, campanulatus, 5–6 mm. longus, 5-lobatus, extus parce puberulus intus praeter lobos glaber sed manifeste papillosus lobis tri-

\* Type specimens listed in this paper are deposited in the Herbarium of the Botanical Institute, Sun Yatsen University, Canton, China; duplicate types will be sent abroad as soon as conditions permit.

angulari-lanceolatis tubo aequantibus, margine dense ciliolatis. Flores ♂ : androphorum 3 mm. longum gracile, glabrum; antherae 10, ad apicem androphori sessiles, biloculares, connectivo crasso. Flores ♀ : antherae circiter 15, circa basin ovarii aggregatae; ovarium cum gynophoro 1.2 mm. longo dense tomentosum, globosum, 5-loculare; stylus gynophoro aequilongus pubescens; stigma 5, globosa. Fructus ignoti.

YUNNAN: King-Tung District, Tsu-Kai, alt. 1400 m., tree 7 m. tall, in light woods, leaves lustrous green above, pale green beneath, flowers white, Oct. 5, 1933; *Y. Tsiang* 12308.

This very distinct species is not closely allied to any of the known Chinese species. It is characterized by stout branchlets with broad spongy pith and relatively small white flowers in slender panicles.

*Sterculia Henryi* Hemsley var. *cuneata* Chun et Hsue, var. nov.

Planta habitu omnino typi et fortasse cum eo congruens sed foliis deorsum manifeste attenuatis basi cuneatis acutisve haud rotundatis, floribus minoribus.

Arbor vel arbuscula 3–5 m. alta. Folia obovato-oblonga 15–21 cm. longa, 4.5–6.5 cm. lata, apice plus minusve longe subitque acuminata, infra medium versus basin distincte attenuata, basi cuneata vel acuta; petiolus 4–8 cm. longus. Racemi usque ad 7 cm. longi. Flores (e nota ad vivum) pallide rosei; calycis segmenta vix ultra 10 mm. longa.

YUNNAN: Ma-Kuan Hsien, N. W. of Ta-Wei Shan, alt. about 1000 m., in dense wooded ravine along stream, shrub 3–5 m. tall, flowers pale red, March 15, 1940, *Wang, Ko and Lau* 10032; same locality, Ching-ya, alt. 800 m., tree on sparsely wooded slope, flowers pink, April 4, 1940, *Wang, Ko and Lau* 10496 (TYPE).

*Reevesia lofouensis* Chun et Hsue, sp. nov.

Arbor vel frutex, 4–13 m. alta, ramulis novellis dense stellato-tomentosis, fere levibus, siccitate albo-flavidis. Folia coriacea elliptico-oblonga 10–15 cm. longa, 3.5–6 cm. lata, apice in acumen latum obtusum vel acutiusculum contracta, basi inaequilateraliter cuneata, utrinque glabra, margine undulata, in sicco utrinque brunnescentia, costa subtus elevata, nervis primariis lateralibus utrinque 6–8, sursum furcatis, subtus tantum elevatis, venulis supra fere obsolete; petiolus 1–3.5 cm. longus teres utrinque vix dilatatus, novellus stellato-tomentosus, mox glabrescens. Inflorescentia non satis evoluta paniculata, terminalia, circiter 4 cm. longa lataque, multiflora, dense fulvido-stellato-tomentosa. Gemmae florales obovoideo-globosae, circ. 2 mm. diam. Capsula oblongo-pyriformis, 5-angulata, rugosa, dense stellato-puberula; pedicellus circ. 2 cm. longus; semina 12 mm. longa 6 mm. lata, elongato-ellipsoidea, glabra, alis oblongis obtusis hyalinis nitidis brunneis, 2 cm. longis, 1 cm. latis.

KWANGTUNG: Lo-Fou Shan, Hua-Hsou Tai, tree 13 m. tall in woods, branchlets green, leaves deep green above, pale green beneath, May 3, 1930, flowers in bud, *N. K. Chun* 40829; same locality, shrub 4 m. tall, fruit green, brownish tinged, July 24, 1930, *N. K. Chun* 41342 (TYPE).

This species is related to *Reevesia thyrsoidea* Lindley and *Reevesia longipetiolata* Merr. et Chun, but differing from both in its densely stellate-tomentose branchlets and peduncles, thicker, fewer veined, cuneate leaves, and tomentose petiole not dilated at both ends.



*Reevesia taiwanensis* Chun et Hsue, nom. nov.

*Reevesia formosana* Hayata Ic. Pl. Formos. 9: 8. 1919, non Sprague in Kew Bull. 1914: 325. 1914.

FORMOSA: Hiranzan, leg. Hayata et Sasaki s. n., July 1912.

Although the two specimens are not exactly comparable, the one collected by A. Henry on which Sprague's species is based is in flower, and the other, described by Hayata, is in fruit, we are confident that two distinct species are involved judging by vegetative characters alone. *Reevesia formosana* Sprague is easily distinguished by the rounded to cordatulate leaf-bases.

*Helicteres viscida* Blume Bijdr. 1: 79. 1825; Kurz Fl. Brit. Burma 1: 143. 1877; Pierre Fl. Cochinch. pl. 209A. 1888-91; Gagnep. in Lecomte Fl. Gén. Indo-Chine 1: 489. 1911; Ridley Fl. Malay Peninsula 1: 281. 1922; Chung in Mem. Sci. Soc. China 1: 168. 1924; Craib Fl. Siam. Enum. 1: 175. 1925.

HAINAN: Po-Ting District, vicinity of Tung-Chiah, in ravine, subshrub, flowers white, Dec. 4, 1936, *L. Tang* 430; same locality, Oct. 10, 1936, *S. K. Lau* 28343; Ting-An District, Dec. 4, 1933, *C. Wang* 35181; Ling-Shui District, Seven-Finger Mountain, Jan. 11, 1934, *C. Wang* 36352; Ling-Shui District, Tung-Chiah, Nov. 18, 1932, *Tso & Chun* 44283.

DISTRIBUTION: Java, Malay Peninsula, Burma, Indo-China, Siam, China: Yunnan (fide Gagnepain, l.c.). New to Hainan.

*Eriolaena spectabilis* (DC.) Planchon ex Mast. in Hook.f. Fl. Brit. Ind. 1: 371. 1874.

*Wallichia spectabilis* DC. Mem. Mus. 10: 104. t. 6. 1823.

*Microlaena spectabilis* Wall. List No. 1173, 1828.

*Gumsia tiliacea* Wall. List No. 1173D, 1828.

*G. chloroxylon* Ham. in Wall. List p. 157. 1173E. 1828.

*Eriolaena* sp. Chung in Mem. Sci. Soc. China 1: 167. 1924.

YUNNAN: Szemao, *A. Henry* 12506, ex Herb. Kew; Mi-Le Hsien, Dec. 2, 1932, *H. T. Tsai* 51393. KWANGSI: Hsi-Lin District, alt. about 800 m., tree 7 m. high, bark gray, fruits silvery, dehiscent, July 2, 1936, *W. H. Soo* 67905.

DISTRIBUTION: India, Central Himalaya; China: Yunnan, Kwangsi.

*Henry's* 12506 which the senior author examined at Kew undoubtedly belongs to this species. Presumably this is the first authentic record of the species for China.

BOTANICAL INSTITUTE,

SUN YATSEN UNIVERSITY,

CANTON, CHINA.

## KAJEWSKIELLA, A NEW RUBIACEOUS GENUS FROM THE SOLOMON ISLANDS

E. D. MERRILL AND L. M. PERRY

*With one plate*

KAJEWSKIELLA GEN. NOV.

Calycis tubus cylindricus, gracilis; limbi cupularis lobi 5, lineares, elongati, persistentes. Corolla tubularis, in alabastro oblongo-clavata, extus dense villosa, tubo intus glabro; limbi lobi 5, erecti, valvati. Stamina 5, basin paullo supra tubi corollae inserta, filamentis compressis, glabris; antherae dorso affixae, non versatiles, paullo exsertae, lineares, obtusae. Discus annularis. Ovarium 2-loculare; stylus teres, exsertus, stigmatibus punctiformi; ovula numerosa, placentis septo adnatis inserta. Capsula erecta, teres, siliquaeformis, septicide 2-valvis, vetusta epicarpio (demum saepe fibroso) ab endocarpio cartilagineo margine placentifero vel nudo secedente, polysperma. Semina numerosa, adscendentia, minuta, in sicco angulata, testa reticulato-punctata, albumine carnosio; embryo clavato-oblongus. Frutices ramosi, pubescentes. Folia opposita, petiolata, membranacea, lanceolata vel elliptico-lanceolata. Stipulae interpetiolares, triangulari-ovatae, subpersistentes. Racemi simplices, axillares, pauciflori, sub anthesin abbreviati, in fructu longissime pedunculati. Flores majusculi, pubescentes.

*Kajewskiella trichantha* sp. nov.

Frutex usque ad 5 m. altus; ramulis teretibus vel internodiis superioribus compressis, villosulis; foliis membranaceis, lanceolatis vel elliptico-lanceolatis, 12–25 cm. longis, 3.5–8 cm. latis, utrinque sensim angustatis, basi attenuatis in petiolum decurrentibus, apice acute acuminatis, acumine 1–1.5 cm. longo, margine integris, supra costa villosa lamina consperse et sparsim pilosa, subtus novellis dense adpresse ferrugineo-villosis vetustioribus costa venisque dense et lamina sparsim adpresse villosis, nervis lateralibus utrinsecus 15–20 oblique arcuatis prope marginem adscendentibus, utrinque perspicuis, venulis manifestis vel inconspicuis; petiolo 1.5–5.5 cm. longo, gracili, villosio; stipulis triangulari-ovatis, 1–1.5 cm. longis, 5–7 mm. latis, longiuscule acuminatis, costa et basin versus  $\pm$  adpresse villosulis, marginem versus glabris, subpersistentibus; racemis axillaribus, ad anthesin 5–7 cm. longis (floribus inclusis), in fructu 6–17 cm. longis, omnino villosulis; floribus 3–7, pedicellatis, pedicellis brevibus basi bracteatis; calycis limbo cupulari, 2.5 mm. longo, lobis linearibus, acutiusculis, 5–7 mm. longis, 1 mm. latis; corolla tubulari vel in alabastro oblongo-clavata, tubo 2.5–3 cm. longo, 6–7 mm. diametro, intus glabro, lobis circiter 7 mm. longis, acutis, erectis vel adscendentibus, intus glabris; staminibus  $\pm$  5–7 mm. supra basin corollae tubi insertis, paullo exsertis,

filamentis compressis, glabris, antheris linearibus, 4 mm. longis, dorso affixis, non versatilibus, rimis introrsum dehiscentibus; disco annulari; stylo tereti, 3.9 cm. longo, stigmatibus punctiformi, non papilloso; ovario tubulari, 6–7 mm. longo, vix 1.5 mm. diametro, biloculare; capsula vix 3 cm. longa, 2 mm. diametro, calyce persistente coronata; seminibus numerosis, minutis, reticulato-punctatis.

SOLOMON ISLANDS: Bougainville: Kupei Gold Field, *Kajewski 1659, 1667*, April 1930, alt. 950 and 900 m., rain forest (plant up to 5 m. high, but often found much smaller; buds 4.5 cm. long, 1.3 cm. diameter, beautiful pink, semi-transparent); same locality, *Kajewski 1734* (TYPE), April 1930, alt. 1000 m., rain forest (flowers pink, covered with white hairs).

While working over the Rubiaceae of Papuasias as represented in the Richard Archbold Expeditions collections from New Guinea, and the Brass and Kajewski collections from the Solomon Islands, we found the above cited specimens which we were unable to name to genus, although they clearly belong in the family. For this material we here propose the new genus *Kajewskiella*. At present we are unable to suggest an affinity for it. According to the classification of the family in Engler and Prantl, *Pflanzenfam.* IV. 4: 16. 1891, it seems to belong to the Oldenlandieae. In its ferrugineous-villous indumentum, in its stipules, in the form and texture of the leaves as well as in the venation, and in the minute reticulate-punctate seeds, *Kajewskiella* strongly suggests *Xanthophyllum* Reinw., but in its technical characters it is not allied to that genus. The very slender terete capsule is somewhat like an abbreviated fruit of *Dolicholobium* A. Gray; both have septicial dehiscence, and the exocarp becomes more or less shredded in age as in that genus, and in *Bikkia* Reinw.; the valves of the fruit persist as in the latter genus, and the placentae are either broken free or attached along the margins of the valves. The similarity of these characters, however, is probably only superficial. The fairly large tubular or very narrowly elongate obconical corolla entirely glabrous within, the glabrous stamens attached a little above the base of the corolla (about where it emerges from the calyx), the non-papillate stigma, and the short slender terete capsule seem to offer a combination of characters which we believe worthy of generic recognition.

#### EXPLANATION OF PLATE

##### PLATE I

FIG. a. Flowering branchlet,  $\times \frac{1}{2}$ ; b. Flower,  $\times 1$ ; c. Flower laid open,  $\times 1$ ; d. Fruit,  $\times 1$ ; e. Old fruit after dehiscence,  $\times 1$ ; f. Portion of placenta to show attachment of ovules,  $\times 10$ ; g. Seed,  $\times 10$ .

ARNOLD ARBORETUM,  
HARVARD UNIVERSITY.





KAJEWSKIELLA TRICHANTHA MERRILL & PERRY



## TWO NEW FLOWERING PLANTS FROM ST. LUCIA

A. C. SMITH AND H. A. GLEASON

AMONG the West Indian specimens which Dr. John S. Beard, formerly of the Forest Department, Trinidad, has sent to the Arnold Arboretum in recent years, the two species from St. Lucia discussed below appear to be hitherto undescribed.

## ROSACEAE

*Licania oligantha* A. C. Smith, sp. nov.

Arbor 5–15 m. alta, ramulis gracilibus, hornotinis complanatis sericeo-puberulis, annotinis teretibus glabrescentibus lenticellatis; stipulis lineari-lanceolatis 4–8 mm. longis sericeis mox caducis; petiolis subteretibus rugulosis 2–5 mm. longis primo pallide sericeis mox glabris; laminis chartaceis utrinque in sicco olivaceis oblongo-ellipticis, (3.5–) 5–10.5 cm. longis, (1.8–) 2.5–4.5 cm. latis, basi obtusis vel acutis et in petiolum breviter decurrentibus, in apicem calloso-apiculatum cuspidatis, margine integris et leviter recurvatis, juventute subtus et costa supra sparse strigillosis mox glabrescentibus, costa supra leviter elevata subtus prominente, nervis secundariis utrinsecus 6–10 erecto-patentibus leviter curvatis anastomosantibus et rete venularum copioso utrinque prominulis; inflorescentiis plerumque axillaribus interdum terminalibus compacte cymoso-paniculatis sub anthesi 1–2.5 cm. longis et plerumque 1–5-floris, pedunculo leviter complanato brevissimo et ramulis sericeo-puberulis, bracteis oblongis puberulis 3–3.5 mm. longis, ramulis lateralibus paucis 2–5 mm. longis plerumque unifloris raro 2- vel 3-floris, bracteolis 2 oppositis membranaceis ovatis 2–2.5 mm. longis minute sericeis; floribus subsessilibus, pedicellis ad 1.5 mm. longis; calyce cupuliformi sub anthesi 5–6 mm. longo et apice diametro, extus arcte sericeo, tubo 2–2.5 mm. longo basi subacuto intus copiose et breviter sericeo, limbo erecto-patente profunde 5-lobato, lobis papyraceis deltoideis  $3-3.5 \times 2-3$  mm. apice acutis intus puberulis basi anguste imbricatis; petalis 5 membranaceis obovato-vel ovato-ellipticis, 2–3 mm. longis, 1.3–1.5 mm. latis, basi rotundatis, apice obtusis, intus hispidulis extus puberulis mox glabrescentibus et caducis; staminibus 15–20 sub anthesi leviter exsertis, filamentis ligulatis 2.5–3.5 mm. longis utrinque copiose pallido-hispidulis superne angustatis glabrisque, antheris ellipsoideis 0.5–0.6 mm. longis; ovario ellipsoideo copiose hispidulo, stylo tereti circiter 5 mm. longo praeter apicem glabrum copiose hispidulo, stigmate minute peltato.

ST. LUCIA: Quillesse, alt. 300 m., *J. S. Beard* 492 (TYPE, Arnold Arb.), June 5, 1945 (tree 15 m. high, rare in understorey of rain-forest; trunk 50 cm. diam., fluted; flowers creamy white; fruit blue, attractive to birds); La Sorcière, alt. 700 m., *J. S. Beard* 488, June 1, 1945 (tree 5 m. high, in elfin woodland; trunk 30 cm. diam.; flowers creamy white).



*Licania oligantha* is characterized by its very compact few-flowered inflorescences and its concolorous essentially glabrous leaf-blades. From *L. leucosepala* Griseb., originally described from Guadeloupe but also recorded from Dominica, St. Vincent, and St. Lucia (by R. O. Williams, Fl. Trinidad & Tobago 1: 315. 1932, as *Moquilea leucosepala*), the new species differs not only in its inflorescence, but also in its slightly smaller leaf-blades with fewer secondaries and its obscurely sericeous rather than cano-tomentose calyx. In referring plants of this alliance to *Licania* rather than *Moquilea*, I follow the generally accepted reduction of the latter genus.

Concerning this species Dr. Beard writes: "It is a small tree with a trunk up to 30 cm. in diameter; the wood is hard and of no economic value. It is almost confined to the exposure sub-type of the rain-forest in the interior of St. Lucia, occurring on the crests of all but the highest ridges and Pitons. I have noted it on La Sorcière, Piton Flore, Piton St. Esprit, Grand Magazin, Morne Tabac, and the slopes of Morne Gimie, at elevations of 1600 to 2200 ft. [Note: The type-collection was found at a lower elevation]. The species is not found in the elfin woodland at the top of Morne Gimie (3000 ft.), and it is very rare in the normal rain-forest of lower elevations. In its particular association it is one of the principal dominants, forming approximately 30% of the stand. The associate dominants are *Micropholis chrysophylloides*, *Myrcia* sp. (Beard no. 478), and *Tovomita Plumieri*. Together with a number of species of lesser abundance, these plants form a low forest of small trees some 30 ft. high, a reduced type due to exposure to wind. In the other islands the principal dominants of the equivalent forest type are *Richeria grandis*, *Micropholis chrysophylloides*, and *Podocarpus coriaceus*. The first of these has not been found by me on St. Lucia, and the last is very rare, found only on Morne Tabac. The *Licania oligantha*-*Micropholis chrysophylloides* association of St. Lucia is, therefore, an interesting special type."

#### MELASTOMATACEAE

*Miconia luciana* Gleason, sp. nov. Sect. *Octomeris*.

Arbor 8 m. alta, ramis juvenilibus sparsissime furfuraceis mox glabris. Petioli usque 7.5 cm. longi, sparse furfuracei praesertim supra atque sparse glanduloso-hirtelli. Laminae tenues virides, ovato-lanceolatae vel fere ellipticae, maxima qua suppetit 20 cm. longa 10 cm. lata, acuminatae, crenato-serratae, subcordatae, 5-nerviae, utrinque glabrae. Inflorescentia pedunculata, late pyramidalis, ca. 1 dm. longa, trichotoma. Flores 5-meri, omnes sessiles, saepe solitarii ad apices ramulorum. Hypanthium obconicum, 2.7 mm. longum ad torum, minutissime furfuraceum. Calycis tubus 0.8-0.9 mm. longus, truncatus, ad marginem fere scariosus; sepala obsoleta; dentes exteriores conici, ad tubum adnati, ultra tubum 0.3 mm. projecti. Petala rosea, obovato-oblonga, 5.5-6 mm. longa, 3-3.5 mm. lata, fere equilatera, vix retusa. Stamina isomorpha; filamenta glabra, 3.3 mm. longa; antherae lineares, 3.2 mm. longae, 2-loculares, poro

terminali dehiscentes; connectivum infra thecas 0.2 mm. productum, simplex, leviter dilatatum. Ovarium fere inferum, 4-loculare; stylus rectus, glaber, 6.7 mm. longus, inferne dilatatus; stigma truncatum.

ST. LUCIA: Quilesse, alt. 300 m., *J. S. Beard* 477 (TYPE in herb. N. Y. Bot. Gard.; dupl. Arnold Arb.), May 23, 1945 (tree 8 m. high, in understorey of rain-forest; trunk 10 cm. diam.; flowers pink; local name: *bois cendre*).

From its general aspect and from the nature of the inflorescence and the structure of the flowers, *M. luciana* appears related to the Puerto Rican *M. Thomasiana* DC. It differs from that species in its thinner leaves and various other structural characters.

Of *Miconia luciana* Dr. Beard writes: "It is a small tree, frequently only 3 m. high, with rather conspicuous pinkish flowers. I have found it occasionally in the understorey of the *Dacryodes-Sloanea* rain-forest throughout St. Lucia."

ARNOLD ARBORETUM,  
HARVARD UNIVERSITY,  
and  
NEW YORK BOTANICAL GARDEN.

## ASTRAGALUS IN ARGENTINA, BOLIVIA AND CHILE

IVAN M. JOHNSTON

ONLY IN SOUTH AMERICA does the great genus *Astragalus* have an extensive development in the southern hemisphere. There are ten species reported from the mountains and plateaus of tropical Africa. In the temperate southern parts of that continent the genus is represented only by one species in Natal. In South America, however, there are nearly ninety species. The genus is represented along the cordilleras from Ecuador to the Straits of Magellan, and has two important centers of speciation, one in the high country of northwestern Argentina and adjacent Bolivia and another in adjoining Chile and Argentina along the cordilleras south of the peak of Aconcagua.

Though the present paper treats the species known from south of Peru, all the South American species of *Astragalus* were studied during its preparation. Accounts of the two Ecuadorean species, and of seven of the Peruvian species have already been published, Jour. Arnold Arb. 19: 88-96 (1938). The present paper treats the remaining seventy-seven species of the genus known to me from South America.

In general structure and appearance the South American *Astragali* are rather similar to those found in North America. Their relations are with the North American and not with the Old World members of the genus. They are probably the products of an ancient southern migration and subsequent differentiation of various types originating in North America where the genus has one of its major evolutionary centers. In North America, *Astragalus* is represented from Alaska and Baffinland south to northern Guatemala, with most of its more than three hundred species concentrated in western United States. The areas occupied by North and South American species are, accordingly, separated by Colombia and nearly all of Central America, and their major areas of speciation by the great distance between Argentina and the United States.

The close relationship between North American species and others in Argentina and Chile is frequently very clear. Indeed, some of the southern plants seem to be more closely related to the northern ones than they are to any found on their own continent. None, however, seems to be specifically identical with North American plants. Though there are many close similarities between northern and southern species, evolution in South America has not closely paralleled that in North America. This becomes very clear if an attempt is made to apply to the South American species the system of segregate genera set up for the North American species by Rydberg, No. Am. Fl. 24: 251-462 (1929), and Am. Jour. Bot. 15: 584-595 (1928), 16: 197-206 (1929), and 17: 231-238 (1930). Some of the South American species fall readily into the Rydbergian



segregates, but many straddle the arbitrary lines between these so-called genera, and others simply do not fit into any of them.

No satisfactory subgeneric classification of the South American species has been worked out. Rydberg's classification seems artificial at many places and furthermore is to be condemned as provincial, since it is based almost exclusively on species of one region and without full consideration of those in other parts of the world. It would have to be modified considerably, as well as amplified by the addition of comparable new groups, before it could accommodate the South American species satisfactorily. That, however, is a task that should be left to a monographer with a wide acquaintance of the genus as developed in all parts of the world. *Astragalus* has only one clean line of cleavage in South America. This breaks the genus into two natural groups probably worthy of generic recognition. One, the section *Phaca*, with fifteen species, is readily distinguished by its well separated, distinct, herbaceous stipules. The other, the section *Euastragalus*, has more or less united, membranous, ochraceous stipules and includes over seventy species.

In the present paper the synonymy given for the species is complete except for certain names published by Otto Kuntze, *Rev. Gen.* 2: 940-949 (1891), and 3<sup>2</sup>: 73 (1898). Substituting the name *Tragacantha* for *Astragalus*, Kuntze published hundreds of new combinations under the former invalid name. It has seemed a waste of space to reprint the scores and scores of useless binomials he applied to South American species. Only when he coined new specific epithets for South American species, are Kuntze's names of any taxonomic significance and only the latter are listed in the synonymy given in this paper.

Among the large number of specimens studied, only about half are cited. Under well understood species, of which I have seen numerous specimens, I have cited only selected collections to show geographic range. Only under new, rare, or poorly understood species has all the examined material been cited. The particular herbaria in which the examined specimens are located are indicated by abbreviations, in parentheses, following the collector's name.

During the preparation of this paper the specimens in many herbaria have been examined. The basic herbarium and library work was carried on at the Gray Herbarium. During a visit to Europe the genus was studied at Kew, London, Hamburg, Berlin, Munich, Geneva, and Paris, and loans of selected material from these botanical centers were later studied at the Gray Herbarium in conjunction with loans of South American *Astragali* from Stockholm, Upsala, New York, Washington, and Chicago. From South America much interesting material has been received on loan and for identification. Dr. Angel Cabrera of La Plata, sent specimens and arranged the loan of Spegazzini's *Astragalus*. To Prof. L. R. Parodi, Dr. Arturo Burkart, Prof. Alberto Castellanos, Sr. A. Ruiz Leal, and Sr. Juan V. Monticelli I am indebted for many interesting specimens. Prof. Marcial R. Espinosa sent me some of the collections

and very obligingly loaned me fragments of certain critical specimens in the Philippi Herbarium. Other very interesting and useful Chilean collections have been received from Sr. Gualterio Looser, Sr. Gilberto Montero, and Dr. C. Grandjot. I have had help from many sources and I am grateful to the many botanical friends in Europe and America who have aided in this work on the genus *Astragalus*.

The abbreviations for the herbaria cited in this paper are as follows: BD=Herb. Bot. Mus., Berlin-Dahlem, Germany; Behn=Herb. Dr. K. Behn, Valparaiso, Chile; BM=Herb. British Mus. Nat. Hist., London, England; Boiss=Boissier Herb., Geneva, Switzerland; Burkart=Herb. Inst. Bot. Darwinion, Buenos Aires, Argentina; Calif=Herb. Univ. California, Berkeley, California; Del=Delessert Herb., Geneva, Switzerland; FM=Herb. Chicago Nat. Hist. Mus. [Field Mus.], Chicago, Illinois; G=Gray Herb., Harvard Univ., Cambridge, Massachusetts; Gottenburg=Herb. Hort. Bot. Gottenburg, Gottenburg, Sweden; Grandjot=Herb. Dr. C. Grandjot, Santiago, Chile; Hamb=Herb. Inst. Allg. Bot., Hamburg, Germany; K=Herb. Roy. Bot. Gard., Kew-Surrey, England; LP=Herb. Mus. La Plata, La Plata, Argentina; Munich=Herb. Bot. Mus., Munich, Germany; NY=Herb. New York Bot. Gard., New York, New York; Paris=Herb. Mus. Hist. Nat., Paris, France; Parodi=Herb. Dr. L. R. Parodi, Buenos Aires, Argentina; Santiago=Herb. Mus. Nac., Santiago, Chile; Speg=Herb. Mus. La Plata, La Plata, Argentina; Stock=Herb. Riksmus., Stockholm, Sweden; US=United States Nat. Herb., Washington, D. C.; Upsala=Herb. Upsala Univ., Upsala, Sweden.

#### KEY TO SPECIES

A. Stipules herbaceous, not united, separated by a quarter of the circumference of the stem.

Legumes compressed, scarcely if at all inflated, rather closely investing the 1-3 seeds, 5-13 mm. long.....1. *A. Chamissonis*

Legumes distinctly inflated, 8-40 mm. long; seeds more numerous and at maturity rattling about within the mature pod.

Pods evidently stipitate, the stipe 3-10 mm. long; pedicels becoming 5-7 mm. long; standard yellow.

Fruit distinctly pendulous.....2. *A. Pissisi*

Fruit strict or ascending.

Pods broadest above middle; leaves flat; flowering inflorescence short and dense.....3. *A. Edmonstonei*

Pods broadest below middle; leaves conduplicate; flowering inflorescence becoming loose and elongate.....4. *A. timariensis*

Pods sessile or with a stipe less than 3 mm. long.

Legumes small, 8-15 mm. long, usually strict or ascending.

Pedicels 3-5 mm. long at anthesis, becoming 5-7 mm. long in fruit; standard yellow; leaflets frequently verticillate.....5. *A. verticillatus*

Pedicels 0.5-1.5 mm. long at anthesis, becoming 1-2.5 mm. long in fruit; standard purple or violet; leaflets in simple pairs.

Herbage glabrous; leaflets thickish; plant montane.....6. *A. Looserii*

Herbage hairy; leaflets not very thick nor fleshy; plants of low altitudes.....7. *A. Berterianus*

Legumes medium to large, 15-40 mm. long.

Plants annual or at least short-lived; corolla pinkish; arid coastal regions of northern Chile.

Herbage pallid with a dense velvety indument...8. *A. paposanus*

Herbage green or somewhat cinereous, strigose.....9. *A. coquimbensis*

Plant strongly perennial, montane.

Legumes strictly erect, lancoid, tough and rigid, opaque, lustrous brown at maturity.....10. *A. curvicaulis*

Legumes spreading and becoming pendulous, ovoid or ellipsoid, papery, translucent, pale or mottled at maturity.

Ovary and fruit glabrous.

Leaves glabrous or with the hairs confined to the margins and midrib of the leaflets...11. *A. pehuenches*

Leaves sparsely but evidently strigose.....12. *A. valerianensis*

Ovary distinctly strigose and fruit at least sparingly so.

Corolla pinkish; flowers dense, 15-30; pods 15-20 (-25) mm. long, numerous and congested in globose clusters; northern Chile.....13. *A. vagus*

Corolla with at least the standard conspicuously purple or violet; pods not in dense clusters.

Leaflets smooth, strigose with closely appressed silky hairs; pods 2-4.5 mm. long.....14. *A. Darumbium*

Leaflets somewhat shaggy with short ascending to spreading hairs; pods 2-3 cm. long.....15. *A. monticola*

AA. Stipules membranous, more or less united into an amplexicaul sheath.

B. Fruit with the sutures not inflexed nor recessive, or with the lower one more prominent than the upper.

Peduncles 2-15 cm. long, equalling or surpassing the subtending leaf; flowers numerous; Patagonia and the andes of middle and southern Chile and Argentina.

Fruit not compressed about the margin of the valves, the sutures not salient.

Plant densely short villous, the hairs more or less curly and spreading; leaflets obcordate, plicate; pods short villous...16. *A. vesiculosus*

Plant strigose to glabrous, hairs appressed; leaflets acute to weakly retuse, elliptic to lanceolate, revolute; pods mottled, prevailingly glabrous.

Leaflets more or less strigose above; wings conspicuously surpassing the keel.....17. *A. Arnottianus*

Leaflets glabrous above; wings shorter than the keel or of about equal length.....18. *A. palenae*

Fruit compressed at least about the margin of the valves, tough and leathery, the sutures prominent, elevated on the compressed rim of the fruit.

Pod somewhat compressed dorso-ventrally, more or less triangular in cross-section, lower suture most prominent; corolla ca. 12 mm. long, petals all broad; eastern Argentina.....19. *A. argentinus*

Pod flattened laterally, linear to lenticular in cross-section, sutures equally prominent; corolla 15-20 mm. long, the petals narrow and elongate.

Plant villous, pallid; calyx with pale hairs; fruit valves wider than long.....20. *A. Illinii*

- Plant short strigose or glabrous; calyx usually with black hairs; fruit valves longer than broad.  
 Leaflets elliptic to oblanceolate, apex rounded or emarginate.  
 .....21. *A. Cruckshanksii*  
 Leaflets oblanceolate to linear, apex acute.  
 Stems elongate, 1-5 dm. long, internodes well developed, bearing scattered leaves; peduncles obviously axillary.....22. *A. Amunategui*  
 Stems short, usually 0.5-5 cm. long, slender, with very much shortened internodes; leaves appearing to be tufted and the peduncle scapose...23. *A. patagonicus*  
 Peduncles very short, 0-1.5 cm. long, conspicuously shorter than the subtending leaf, 1-7-flowered; high altitudes in Bolivia and northern Chile and Argentina.  
 Ovary glabrous; fruit glabrous, 10-15 mm. long; plant caespitose with green 2-6-jugate leaflets; peduncles 2-4-flowered, becoming 1-5 mm. long; northwestern Argentina.....24. *A. Burkartii*  
 Ovary strigose; fruit pallid, strigose, 4-7 mm. long; plants with dense appressed pale indument; leaflets 5-9-jugate.  
 Plant densely caespitose, the leaf-tufts usually springing from an evident collar of tough flavescent stipules; fruit subsessile, solitary, remaining hidden among stipular sheaths, 3-4 mm. long, valves 2-3 mm. broad; northern Argentina.....25. *A. crypticus*  
 Plant with elongating leafy stems, 1-15 cm. long; fruit becoming evident, 6-7 mm. long, valves 5-6 mm. wide.  
 Fruit usually solitary in the leaf-axils, becoming exposed along the older parts of the coarse trailing stems; northern Argentina and adjacent Chile.....26. *A. cryptobotrys*  
 Fruits several to many on evident axillary peduncles; peduncles 1-15 mm. long.  
 Plant coarse; leaflets lanceolate, 3-10 mm. long, apex acute; corolla 14 mm. long; valves broadest below middle; Bolivia.....27. *A. Asplundii*  
 Plant slender; leaflets oblong or elliptic, 3-4 mm. long, apex rounded or obtuse; corolla ca. 6 mm. long; valves broadest at or above the middle; Andes of Coquimbo and San Juan.....28. *A. bellus*  
 BB. Fruit with the lower suture inflexed, or at least less prominent than the upper one.  
 C. Fruit distinctly pendulous or reflexed.  
 D. Plants of Argentina.  
 Leaflets cuneate to deltoid, broadest at apex and very deeply and conspicuously emarginate; fruit 25-30 mm. long, falcate, upper edge convex in outline.....29. *A. tehuelches*  
 Leaflets linear to elliptic, broadest near middle, the apex acute to inconspicuously retuse; fruit with upper edge straight or concave in outline, except in *A. Ruiz-Lealii*.  
 Plant abundantly appressed villous, pallid, caespitose, the pods apparently short and not much surpassing the calyx; Chubut.  
 .....30. *A. chubutensis*  
 Plant prevailing short strigose, cinereous to green, stems elongated and slender, loosely branched; pods elongate.  
 Fruit plump, in cross-section more or less circular or elliptic, valves distinctly convex, lower suture depressed in a shallow narrow groove; corolla ochroleucous and merely spotted with blue or purple.



Valves swollen on either side of the dorsal suture, the suture appearing to be inflexed, pods becoming leathery or somewhat woody; central and northern Argentina.....31. *A. distinens*

Valves not swollen on either side of the dorsal suture, the suture prominent its whole length, pods less tough and more elongate; northern Patagonia.....32. *A. Bergii*

Fruit angular and more or less laterally compressed, in cross section more or less sagittate or cordate to triangular, valves plane on the sides, lower suture inflexed.

Corolla 8-14 mm. long, bright colored; ovary and fruit glabrous.

Plant annual; fruit more than 6 times as long as broad; Rio Negro.....33. *A. Spegazzinii*

Plant perennial; fruit 2-4 times as long as broad.

Pod 10-18 mm. long, strongly and acutely triangular, lateral angles much more prominent than the lower suture; valves readily and completely separating at maturity; Mendoza and Cordoba....34. *A. carinatus*

Pod 5-9 mm. long, lateral angles rounded and less acute than the lower suture; valves much tougher than in the last, very tardily if at all separating at maturity; Cordoba.....35. *A. Parodi*

Corolla 4-7 mm. long, coloring pale.

Inflorescence with numerous rather crowded flowers; stems elongate, 1-4 dm. long; north-western Argentina.....36. *A. Joergensenii*

Inflorescence with few (2-7) distinctly scattered flowers; stems 1.5 dm. long or less.

Ovary glabrous; fruit oblong, valves 3-4 times as long as broad, upper suture straight or concave in lateral outline; leaflets glabrous above; Rio Negro and Chubut.....37. *A. pauranthus*

Ovary strigose; fruit falcate, valves 6-10 times as long as broad, upper suture convex in lateral outline; leaflets strigose above.....38. *A. Ruiz-Leali*

#### DD. Plants of Chile.

Wings much shorter than the keel.

Fruit and ovary glabrous; plant prostrate, green; leaflets 6-9-jugate; Cautin.....39. *A. Monteroi*

Fruit and ovary strigose; plant prostrate or erect; leaflets 6-16-jugate; Concepcion north to Coquimbo.....40. *A. amatus*

Wings much surpassing the keel.

Leaflets 3; plant densely silky strigose....41. *A. valparadisiensis*  
Leaflets 12-31.

Plant prostrate, stems slender and widely spreading; peduncles scarcely if at all surpassing subtending leaf; corolla large, standard 12-18 mm. long; coast of Antofagasta.....42. *A. cachinalensis*

Plant erect or decumbent; peduncles usually much surpassing the subtending leaf; corolla smaller, standard usually less than 12 mm. long.

Pod curved, lateral outline lunate with upper edge concave and the lower edge strongly convex, their sweeping curves continuing into the style, hence apex of pod gradually attenuate; Coquimbo to Antofagasta.

Fruit loosely and abundantly tomentose; plant perennial, stems 2-6 dm. long; leaflets 8-14-jugate; Coquimbo.....43. *A. nudus*

Fruit strigose to subglabrous; plant prevailing annual; stems 1-4 dm. long; leaflets 5-10-jugate; Atacama and Antofagasta.....

.....44. *A. Doddi*  
Pod straight, in lateral outline more or less oblong, with the upper edge straight or convex and the lower edge more or less convex; style terminating the abruptly contracted apex of the fruit.

Fruit laterally much compressed, the lower suture narrowly and deeply inflexed, the sides of the pod nearly parallel; ovary usually hairy; leaflets usually rounded to acute at apex; coastal areas east to base of cordilleras.....45. *A. Berteri*

Fruit triquetrous, with three subequal faces, the lower suture medial on the flattish lower side; ovary glabrous; leaflets usually obtuse or retuse at apex; cordilleras.....46. *A. Germaini*

CC. Fruit strict or ascending, not pendulous.

E. Plants with elongating stems, not caespitose nor pulvinate.

Plant coarse; stipules very large and loosely sheathing, 5-10 mm. long; leaflets usually flat; fruit with well developed false septum.

Fruit evidently villous-strigose; corolla over 1 cm. long; plant usually erect; flowers usually projected beyond the leaves...

.....47. *A. Garbancillo*

Fruit inconspicuously strigose or glabrous; corolla 6-9 mm. long; plant spreading; flowers and fruit much surpassed by leaves.

Plant gray-green, evidently strigose; widely distributed...

.....48. *A. arequipensis*

Plant bright green, nearly glabrous, rare...49. *A. cryptanthus*

Plant slender; stipules small and not very conspicuous, usually less than 5 mm. long; leaflets usually folded or revolute.

Plants of Patagonia and the cordilleras south of Cerro Aconcagua (lat. 33° S).

Fruit slender and elongate, 1-2 cm. long, 2-2.5 mm. in diameter, with a nearly complete false septum and hence, practically.....50. *A. Sanctae-Crucis*

Fruit short and stout, 5-15 mm. long, about half as wide as long, 1-celled, the false septum absent or weakly developed.

Leaves linear-lanceolate to narrowly oblong, apex acute to rounded; fruit becoming tough and rigid; Chile at the west base of the cordilleras.....

.....51. *A. orthocarpus*

Leaves obcordate, strongly retuse at apex; fruit chartaceous.

Herbage green, leaflets glabrous or with only a few scattered hairs along the midrib; south of Neuquen and Talca.....52. *A. Domeykoanus*

- Herbage cinereous, younger leaflets evidently strigose beneath; Mendoza.....53. *A. complicatus*
- Plants from north of Cerro Aconcagua; with the exception of *A. triflorus*, a coastal annual of Peru and no. Chile, all from high altitudes in northwestern Argentina or the Bolivian plateau.
- Fruit densely white villous-strigose, 4-5 mm. long, 2-4-seeded, false septum completely absent; corolla more or less marcescent and investing the ovary at maturity.....54. *A. punae*
- Fruit not pallid, glabrous or somewhat strigose, usually 10 mm. long or more, 4-12-seeded; corollas not marcescent, soon deciduous.
- Flowers small, standard 3-5 mm. long; fruit with the false septum absent or inconspicuous.
- Inflorescence congested even in fruit; pods 2-3 mm. broad; prostrate perennials of high altitudes in Bolivia and Argentina.....55. *A. micranthellus*
- Inflorescence becoming racemose; pods 5-6 mm. broad; erect annual of coastal Peru and no. Chile. ....56. *A. triflorus*
- Flowers larger, standard 5-9 mm. long; fruit with a narrow incomplete false septum.
- Plant cinereous, conspicuously short-strigose; leaves usually shorter than the internodes; leaflets thickish, rounded or obtuse at apex.....57. *A. Famatinae*
- Plant green, glabrous or only sparsely strigose; leaves usually much surpassing the internodes; leaflets less firm and usually strongly retuse at apex.
- Ovary and fruit distinctly strigose; northwestern Argentina and adjacent Bolivia.....58. *A. tarijensis*
- Ovary and fruit glabrous or practically so; Argentina to Peru, rare.....59. *A. Weddellianus*
- EE. Plant caespitose or decidedly pulvinate, leaf-bearing stems very short and not much elongating, usually less than 1 cm. long or if longer then compacted into very dense pulvinate masses (cf. alpine forms of *A. micranthellus* and *A. tarijensis*).
- Plant rhizomatose; fruit 7-13 mm. long, 4-7 mm. wide, strongly flattened laterally, intrusion of lower suture and the false septum largely confined to the attachment-end of pod.....60. *A. Bustillosii*
- Plant without rhizomes.
- Flowers pedicellate, the pedicels 1-4 mm. long, at anthesis elevating the flower above its subtending bract; peduncles usually evident at anthesis, up to 4 cm. long.
- Herbage glabrous or practically so; flower solitary; fruit completely 2-celled by a tough false septum (cf. *A. Weddellianus*).....61. *A. uniflorus*
- Herbage evidently hairy; flowers clustered; fruit 1-celled, the false septum membranous and incomplete or absent.
- Plant yellowish green; calyx-lobes with black hairs; leaflets 3-4-jugate; peduncles 1-3-flowered; ovary glabrous; caudex rather coarse.....62. *A. Venturii*

Plant pallid, frequently somewhat silvery strigose; calyx usually with only pallid hairs.

Ovary and fruit glabrous; leaflets 2-4-jugate; stems with internodes 2-5 mm. long; fruit with an incomplete false septum.....63. *A. confinis*

Ovary and fruit strigose; stems with shorter internodes.

Leaflets lanceolate to narrowly ovate, 2-3 mm. broad, 4-6-jugate; fruit somewhat lunate, 10-15 mm. long and 3-5 mm. high; false septum completely absent.....

.....64. *A. hypsogenus*

Leaflets linear, 1-2 mm. broad, 2-3-jugate; fruit oblong, 6-8 mm. long and 2-4 mm. high, false septum narrow but evident.....

.....65. *A. crymophilus*

Flowers sessile or subsessile, at anthesis base of calyx closely ensheathed by its bract; peduncles extremely short or none (in fruit rarely becoming 3-7 mm. long in *A. minus* and *A. Werdermanni*).

Flowers 4-8, in sessile subumbellate clusters in the leaf-axils, intermixed with large bracts.

Leaflets elliptic to suborbicular, loosely clothed with non-lustrous hairs, usually glabrescent in age, apex truncate to deeply emarginate; stipules white, papery, very broad and loose, usually deciduous.....

.....66. *A. pusillus*

Leaflets ovate to lanceolate, densely and permanently clothed with lustrous hairs, apex acute or obtuse.

Herbage strigose, the hairs ca. 1 mm. long; corolla ca. 6 mm. long; Bolivia and Argentina.....

.....67. *A. Urbanianus*

Herbage appressed villous, the hairs ca. 2 mm. long; corolla ca. 8 mm. long; Central Peru.....

.....68. *A. Dillinghami*

Flowers solitary or geminate in leaf-axils; bracts relatively inconspicuous.

Fruit with a more or less incomplete membranous false septum; valves rather firm and tough.

Leaves canescent or silvery, abundantly appressed villous even in age, not glabrescent; stipules broad and coarse, 5-7 mm. long; leaf-bearing stems coarse, usually 2-3 mm. thick.....

.....69. *A. peruvianus*

Leaves green or cinereous, hairs scattered or disappearing in age and frequently absent on the upper surface; stipules smaller, 2-4 mm. long; leaf-bearing stems slender, 1-1.5 mm. thick.

Leaflets very broadly obcordate with a deeply emarginate apex, strongly folded, sparsely strigose with the hairs lying oblique to the midrib.....70. *A. Werdermanni*

Leaflets orbicular to elliptic or lanceolate, involute-plicate, apex rounded or very weakly and obscurely emarginate, hairs paralleling midrib.



- Leaves appressed short-villous, the hairs loosely appressed particularly on the rhachis, projecting beyond the leaflet-apex in a definite penicillate tuft; stems short and congested, frequently subpulvinate.....71. *A. minutissimus*
- Leaves strigose with shorter more appressed hairs which scarcely, if at all, protrude beyond the leaflet-apex; stems elongating, forming prostrate mats... ..72. *A. minimus*
- Fruit without any false septum, valves rather thin and fragile.
- Plant distinctly pulvinate, the leaves strongly marcescent and persisting on even the oldest stems; young stems slender and elongate, internodes 1-10 mm. long; stipules small, not imbricate; pods 4-5 mm. long, several-seeded; Argentina... ..73. *A. pulviniformis*
- Plant caespitose, the leaves very much less persistent; annual growth of stems short, internodes shorter than the stipules; stipular sheaths imbricate and clothing the stem; pods usually 2 mm. long and 1-2-seeded.
- Stipules with ciliate margins, back glabrous or practically so even when young; calyx-tube cupulate, sparsely strigose.
- Caudex dense, a mass of crowded strict stems and branches intermixed with persistent leaf-remnants; stipules albescent.....74. *A. Reichei*
- Caudex a loose mass of spreading stems and branches, these more or less rope-like and covered with tightly sheathing stramineous stipules, old leaves rather promptly deciduous.....75. *A. flavocreatus*
- Stipules broader and more loosely sheathing, with numerous appressed hairs at least when young; calyx-tube cylindric, densely appressed villous.
- Herbage with non-lustrous indument; stipules papery, albescent; standard with obovate blade; Bolivia and northern Argentina.....76. *A. deminutivus*
- Herbage with lustrous indument; stipules firmer in texture and darkening in age; standard with a suborbicular blade; Central Peru.....77. *A. Dielsii*

1. *Astragalus Chamissonis* (Vogel) Reiche, Anal. Univ. Chile 97: 553 (1897), and Fl. Chile 2: 96 (1898).

*Phaca ochroleuca* Hooker & Arnott, Bot. Misc. 3: 186 (1832). — Type collected at Valparaiso, *Cuming* 389.

*Astragalus ochroleucus* (H. & A.) Gray, Bot. U. S. Explor. Exped. 1: 413 (1854). Not Gilibert (1782).

*Phaca Chamissonis* Vogel, *Linnaea* 10: 592 (1836).—Type collected between Talcahuano and Concepcion, *Chamisso*.

*Phaca chilensis* Nees, *Del. Sem. Hort. Vratislav.* (1833), and *Linnaea* 10: Litt. 72 (1836).—Described from garden material; perhaps from seeds originally sent to Europe from Chile by Bertero.

*Astragalus chilensis* (Nees) Reiche, *Anal. Univ. Chile* 97: 111 (1897), and *Fl. Chile* 2: 111 (1898), not Sheldon (1894).

*Astragalus placens* Clos in Gay, *Fl. Chile* 2: 109 (1846).—Type collected near Valparaiso, *Gay 467*.

*Astragalus ovalensis* Clos in Gay, *Fl. Chile* 2: 116 (1846).—Type collected in "los arroyos del departamento de Ovalle," *Gay 491*.

*Astragalus Volckmanni* Philippi, *Anal. Univ. Chile* 18: 46 (1861), and *Linnaea* 33: 45 (1864); Reiche, *Anal. Univ. Chile* 97: 547 (1897), and *Fl. Chile* 2: 90 (1898).—Type collected at Camarones, southern Atacama, *Volckmann*.

*Phaca araucana* F. Philippi, *Anal. Univ. Chile* 84: 14 (1893).—Type from sands near sea north of Rio Tolten, prov. Cautin, *F. Philippi*.

*Astragalus araucanus* (F. Phil.) Reiche, *Anal. Univ. Chile* 97: 557 (1897), and *Fl. Chile* 2: 101 (1898).

*Astragalus monospermus* Philippi, *Anal. Univ. Chile* 84: 27 (1893); Reiche, *Anal. Univ. Chile* 97: 552 (1897), and *Fl. Chile* 2: 95 (1898).—Type from Las Trancas near Angol, 1881.

*Astragalus laetevirens* Philippi, *Anal. Univ. Chile* 84: 30 (1893); Reiche, *Anal. Univ. Chile* 97: 553 (1897), and *Fl. Chile* 2: 96 (1898).—Type collected at Laja, Bio Bio, *Rahmer*.

RANGE: Widely distributed in central Chile, extending from the southern parts of Atacama south to Cautin, on hills near the coast and at lower altitudes in the Cordillera.

CHILE: Atacama: Camarones, *herb. Reed* as *A. Volckmanni* (K). Coquimbo: Coquimbo, *ex Philippi* as *P. ochroleuca* (US, K); La Serena, 1930, *Claude Joseph 5446* (US); El Molle, 30 km. west of Vicuña, marsh land along Coquimbo River, 400 m. alt., 10–16 dm. tall, fl. white-yellow or pink, *Wagenknecht 18495* (G); Queb. Arrayan, 25 km. south of Estacion Pelicana, 5 dm. tall, fl. yellow-white and violet, *Wagenknecht 18406* (G); ravines of the dept. Ovalle, *Gay 491* (type of *A. ovalensis*, Paris). Aconcagua: Valparaiso, *Cuming 389* (type of *P. ochroleuca*, K, BM); Valparaiso, *Wilkes Exped.* (US); hills near Valparaiso, *Bertero 824* (G, Del, Paris); Potaico near Valparaiso, Feb. 1829, *Gay 467* (type of *A. placens*, Paris). Santiago: Cord. de Santiago, *ex Philippi* as *P. ochroleuca* (BD, Boiss). Colchagua: Cord. de Tinguiririca, 2300 m. alt., 1929, *Pirion 73* (G). Curico: Nacimiento del Teno, Feb. 1896, *Philippi* (G). Maule: Baños de Longavi, Jan. 1888, *Schoenemann* (G); Valle del Maule superior, Cord. Linares, Jan. 1897, *Reiche* as *A. laetevirens* (FM, BD). Nuble: trail to Volcan Antufo, *herb. Reed* as *P. ochroleuca* (K); Cord. de Chillan, *Germain* (K, BM, Del, Boiss); Valle del Renegado, Jan. 1877, *ex Philippi* as *A. Chamissonis* (Speg). Concepcion: La Vega de Concepcion, *Poeppig 97/70* (BD); Concepcion, *D'Urville* (BD), and *Cuming 810* (K); between Talchaguano and Concepcion, *Chamisso* (type of *A. Chamissonis*, BD); Coronel, 1860, *Ochsenius 444* (BD); Itata, Jan. 1878, *ex Philippi* as *P. chilensis* (Speg). Bio-Bio: Valle Renaico, 1897, *Neger* (Munich); San Ignacio de Pemehue, Jan. 1894, *Philippi* (G); Ercilla, Feb. 1892, *Kuntze* as *T. canescens* (NY). Cautin: Budi, Jan. 1923, *Claude-Joseph 1879* (US, NY).

This slender erect-growing fruticose species varies from glabrescent to very densely strigose. The plants with the densest indument come from the province of Concepcion and are the typical form of *A. Chamissonis*. Philippi's *A. monospermus* appears to be this densely strigose form. Plants from beyond the province of Concepcion are much more sparingly strigose and some of these become glabrescent in age. I do not believe

that practicable segregates of this species can be found upon degree of pubescence. The older writers often used greek letters to distinguish this variation. *Phaca ochroleuca* var.  $\beta$  of Hooker & Arnott, l.c., is based upon *Cuming* 810 from Concepcion. It is typical *A. Chamissonis*. At Paris Clos has labeled *Gay* 586 h. Ch., from "Chile," as the var.  $\beta$  and has appended a note which probably indicates the source of his var.  $\delta$ . "Les deux echantillons de *Phaca ochroleuca* H. et Arn. dans l'herbier Webb sont differents en ce qu'un est glabre et l'autre est tomenteux." The var.  $\beta$  of *A. placens*, Clos. l.c. 109, is based upon *Bertero* 824 from Valparaiso.

The inadequately described *P. chilensis* Nees, appears to belong to the present species. At Munich there is a good specimen of our present plant associated with a label reading "*Phaca chilensis* — hort Monoc. — 1838." A similar specimen at Berlin has a label, in three different scripts, which may be indicated as follows, "714 — Dalea? e Chile — var. *dubia* OK — HORT. BOT. BEROL. — 31."

2. *Astragalus Pissisi* (Phil.), comb. nov.

*Phaca Pissisi* Philippi, Anal. Univ. Chile 18: 46 (1861), and Linnaea 33: 45 (1864). —

Given as based upon material from "Chañaral in prov. Coquimbo, Volckmann; radix borealis montis de Chacabuca, ipse."

*Astragalus canescens* var. *Pissisi* (Phil.) Reiche, Anal. Univ. Chile 97: 555 (1897), and Fl. Chile 2: 98 (1898).

RANGE: Hills south of the Rio Aconcagua and north of Santiago; reported from northwestern Coquimbo.

CHILE. Coquimbo: Chañaral, herb Reed as *P. Pissisi* (K). Aconcagua: Montenegro, 1884, *Borchers* (BM, FM). Santiago: Chacabuco, fl. white, ex *Philippi* as *P. Pissisi* (BD, Del, Boiss, Stock); Cuesta de Chacabuca, 1500 m. alt., 1935-36, *Grandjot* (G); near Colina, fl. white, Sept. 1861, ex *Philippi* as *P. Pissisi* (BD, Del).

One of the collection upon which Philippi originally based this very distinct species is labeled as having come from Chañaral, in northwestern Coquimbo. Subsequently, however, the species has been found only in the region about Chacabuca Pass, to the north of Santiago. I suspect that the specimen said to have come from Coquimbo may have been mislabeled.

The coarse flower, the elongate pedicels, and the large papery long-stiped pendulous pods are outstanding characteristics of this species. It is very distinct but probably has its closest relative in *C. limariensis* from which it differs in its coarser flowers, more papery pendulous pods and broader flat closely strigose leaflets.

3. *Astragalus Edmonstonei* (Hook.) Robinson, Proc. Am. Acad. 38: 148 (1902).

*Phaca flava* Hooker & Arnott, Bot. Misc. 3: 186 (Aug. 1832). — Type collected at Valparaiso, *Cuming* 611.

*Astragalus flavus* (H. & A.) Sheldon, Minn. Bot. Studies 1: 158 (1894); Reiche, Anal. Univ. Chile 97: 564 (1897), and Fl. Chile 2: 107 (1898). Not Nuttall (1840).

*Phaca chrysantha* Moris, Mem. Accad. Torino 25: 104, t. 4 (1834). — Based upon plants cultivated at Turin, evidently grown from seed collected by Bertero.

*Astragalus chrysanthus* (Moris) Reiche, Anal. Univ. Chile 97: 565 (1897), and Fl. Chile 2: 108 (1898). Not Boiss. & Hohen. (1849).

*Astragalus affinis* Steudel, Nom. ed, 2, 1: 159 (1840), nomen. — Based upon material from near Quintero, *Bertero* 821.

*Phaca Edmonstonei* Hooker, Trans. Linn. Soc. London 20: 227 (1847). — Based upon collections incorrectly labeled as from the Galapagos Islands, *Edmonstone*.

*Phaca podocarpa* Philippi, Anal. Univ. Chile 84: 22 (1893), nom. provis.; Reiche, Anal. Univ. Chile 97: 564 (1897), and Fl. Chile 2: 107 (1898). — Based upon material from Concon. Not Meyer (1831).

*Phaca acutidens* Philippi, Anal. Univ. Chile 84: 16 (1883); Reiche, Anal. Univ. Chile 97: 564 (1897), and Fl. Chile 2: 107 (1898). — Type from near mouth of the Rio Maule, *P. Ortega*.

*Astragalus Hohenacheri* Spegazzini, Anal. Mus. Nac. Buenos Aires II, 4: 265 (1902).

— A renaming of *A. flavus* (H. & A.) Reiche.

RANGE: Central Chile along the coast.

CHILE. Aconcagua: in pascuis arenosis maritimis, Quintero, fl. flavi, "Yerba loca," Jan. 1830, *Bertero* 821 (Paris, type of *A. affinis*; NY); Quintero, *Werdermann* 15 (G, US, BM, BD); in arenosis maritimis ad Quintero et Concon, *Poeppig* 199/161 (BM, BD, Geneva, Paris); Concon, Oct. 1884, *Philippi* as *P. podocarpa* (G); Reñaca, March 1916, *Jaffuel* 666 (G); Valparaiso, *Buchtien* (BD, US); Valparaiso, 1831, *Cuming* 611 (K, type of *P. flava*). Maule: Constitucion, Oct. 1892, *Reiche* (G). Indefinite: Chile, in arenosi, frequens, Sept. 1831, *Gay* 438 (Paris); Chile, *Bridges* 42 and 43 (K), 44 (BD); "Charles Island, Galapagos," *Edmonstone* (K, type of *A. Edmonstonei*; G).

I have seen specimens of this readily recognizable species from Quintero, Concon, Reñaca, Valparaiso and Constitucion. Of the synonyms listed I have seen authentic material of all but *P. acutidens*. All clearly belong to the unmistakable species treated here.

Though originally given as from the Galapagos Islands, the collection by Edmonstone which is the type of *P. Edmonstonei* is unquestionably the present Chilean plant. Edmonstone was the botanist on the cruise of the *Herald* during which visits were made in Chile (Valparaiso and Concepcion) and Peru as well as on the Galapagos Island. His collections became confused after his untimely death in Ecuador in 1846. It may be noted that the other Galapagean records for *Astragalus* are also based upon falsely labeled specimens. The collection by Du Petit-Thouars, mentioned by Hooker when he described *P. Edmonstonei*, represents flowering material of *A. Menziesii* Gray, probably from Monterey, California. *Astragalus brevidentatus* Wright, Kew Bull. 200 (1906), also attributed to the Galapagos, is certainly this Californian plant. Cf. Johnston Jour. Arnold Arb. 19: 95-96 (1938).

4. *Astragalus limariensis* Muñoz, Jour. Arnold Arb. 20: 246, t. 1 (1939). — Type from Fray Jorge, *Muñoz* 2.

RANGE: Known only from the valley of the Rio Limari, prov. Coquimbo, Chile.

CHILE. Coquimbo: Fray Jorge, Sept. 26, 1939, *Muñoz* 2 (G, type); Fray Jorge, low hills near the buildings of the estancia, Sept. 26, 1939, *Muñoz* B-94 (G); west of Ovalle, Sept. 19, 1917, *Baeza* (G).

A well marked species, probably most closely related to *A. verticillatus* of south central Chile. It agrees with its relative in gross habit, flower shape and size, inflorescence, and narrow elongate leaflets, but differs in its much larger, differently shaped and distinctly stiped pod.



5. *Astragalus verticillatus* (Phil.) Reiche, Anal. Univ. Chile 97: 543 (1897), and Fl. Chile 2: 86 (1898).

*Phaca verticillata* Philippi, Anal. Univ. Chile 84: 15 (1893).—Based upon material from Araucania, *Philippi* in 1887, and from Constitucion, *Reiche*.

*Phaca brachytropis* Philippi, Anal. Univ. Chile 84: 15 (1893).—Type from San Javier, prov. Maule, *P. Ortega*.

*Astragalus brachytropis* (Phil.) Reiche, Anal. Univ. Chile 97: 544 (1897), and Fl. Chile 2: 87 (1898). Not Meyer (1831).

*Astragalus maulensis* Spegazzini, Anal. Mus. Nac. Buenos Aires ser. 2, 4: 264 (1902).—Based upon *A. brachytropis* Reiche, not Meyer.

RANGE: In and along the coastal hills of Chile from Constitucion and Talca southward into northern parts of the province of Concepcion.

CHILE: Talca: Talca, ex *Philippi* as *P. brachytropis* (BD). Maule: Empedrado, Sept. 18, 1892, *Reiche* (G); Villa Alegre de Loncomilla, Oct. 24, 1931, *Espinosa* (G). Concepcion: Penco near Concepcion, Oct. 1896, *Neger* (Munich); Araucania, Nov. 1887, *Philippi* as *P. verticillata* (isotype, G, BM.)

The type of *P. verticillata* is given as collected in Nov. 1887, in "Araucania." It is very similar to the material from Penco collected by Neger. Both specimens have flower but lack fruit. The leaflets are geminate and very slender. During his "Botanische Excursion in das Araukanerland" in Nov. 1887, cf. Bericht. Ver. Naturk. Kassel vol. 41 (1896), *Philippi* visited San Javier, Concepcion, Angol, Traiguén and Temuco. Accordingly his type collection of *A. verticillatus* could have originated in the vicinity of Concepcion where Neger collected specimens very much resembling it.

The material I have seen from the watershed of the Rio Maule is coarser and has less slender leaflets than represented in the type of *A. verticillatus* and in Neger's plant from near Concepcion. This more northern material is that described as *P. brachytropis* upon the basis of a plant from San Javier, prov. Maule. Its leaflets are usually in pairs along both sides of the leaf-rhachis but in one collection from Talca, agreeing in all other details with the species, they are solitary along the rhachis.

The species is evidently related to *A. Pissisi* with which it agrees in such distinctive details as color, size, and structure of the corolla and unusually elongate pedicels. It differs from its relative in having much smaller (5–10 mm. long), globose or ovoid pods, that are sessile in the calyx (not stiped) and borne on erect pedicels. The pods bear scattered appressed usually pale hairs. They are usually abruptly contracted at the base. *Philippi* describes *P. verticillata* as having corollas in which the wings are short and only half the length of the keel. This is evidently a mistake. Authentic material of the species shows the corollas to be like those of *P. brachytropis* which he properly described as having wings almost twice as long as the keel. Reiche so described them in his Flora de Chile.

6. *Astragalus Looserii*, sp. nov.

Planta perennis; caulibus pluribus erectis sparse stricteque ramosis 3–10 dm. altis fistulosus (basim versus 3–5 mm. crassis) apicem versus sparse inconspicueque fusco-strigosis alibi glabratis; foliis glaberrimis concoloribus viridibus, rhachibus 7–15 cm. longis ascendentibus, foliolis crassiusculis

10–12-jugatis 1–2.5 cm. longis 2–4 mm. latis paulo supra medium latioribus apice obtusis vel subtruncatis basi attenuatis; stipulis liberis triangularibus; pedunculis (partibus floriferis inclusis) 15–30 cm. longis foliis duplo longioribus; floribus laxe racemosis (racemis saepe 10–15 cm. longis) stricte ascendentibus; calycibus pilis nigris brevibus abundantibus vestitis, tubo cupulato 2–2.5 mm. longo, lobis subulatis ca. 2 mm. longis, pedicellis ca. 1 mm. longis; corolla 1 cm. longa purpurea vel violacea; leguminibus ascendentibus vel rariter plus minusve recurvatis ca. 1 cm. longis inflatis leviter lateraliterque compressis sparse nigro-strigosis apice acutis basi rotundis vel obtusis infra medium crassioribus.

RANGE: Cordilleras of Santiago, Aconcagua and Coquimbo.

CHILE. Santiago: Fierro Carrera, Las Condes, much branched, up to 1 m. tall, fl. reddish, 2800 m. alt., Jan. 1930, *Gualterio Looser 1132* (type, Gray Herb.); Fierro Carrera, albino form, Jan. 1930, *Looser 1133* (G); Mina de la Disputada, Cord. de las Condes, 3500 m. alt., Dec. 1930, *Father Denys Le Manchee 256* and *257* (G); Las Condes, *herb. Reed* (BM); Cord. de Santiago, Feb. 1870, *Reed* as *P. elata* (K); Cord. de Santiago, *ex Philippi* as *P. Berteriana* (K); Cord. de Santiago, *ex Philippi* as *P. elata* ? (BD, Del); Cord. de Santiago, Jan. 1873, *ex Philippi* as *P. elata* (Speg). Aconcagua: Rio Sobrante, above Chincolco, in vega, 2700 m. alt., fl. blue-white, *Morrison 17323* (G). Coquimbo: Fraguillas, Dec. 1874, *Germain* (G); La Molloc, Cord. de Illapel, Jan. 1888, *ex Philippi* as *P. elata* (BM); Rio Rapel, Higuera, Agua Amarilla, *herb. Reed* as *P. elata* (BM); Rio Rapel, *Reed* (G); bed of the river of San Isidro [Vicuña], stems 5–7.5 dm. tall, 600 m. alt., 1836, *Gay 363* in pt. (Paris); Chile, *Gay 876* in pt. (Paris); Chile, *Gay* as *P. elata* (K, BD, Del).

A species evidently related to *A. Berterianus* and one resembling that species in habit of growth, and size, shape and structure of fruit. The new species is a plant of the cordilleras. Its relative belongs to the valleys and coastal hills and is quickly distinguished from the montane plant by a less robust habit, conspicuously hairy herbage, and smaller, less juicy leaflets. *Astragalus Looserii* is best known from the mountains east of Santiago. Philippi and Reiche seem to have confused it with the very different *A. curvicaulis*. I have been unable to separate the plants of the cordilleras above Santiago from some that come from the cordilleras further north in Coquimbo. The four sheets at Paris collected by Gay and determined by Clos as *P. elata* contain varying mixtures of three species. The predominating plant, however, is the northern form of *A. Looserii*.

7. *Astragalus Berterianus* (Moris) Reiche, Anal. Univ. Chile 97: 555 (1897), and Fl. Chile 2: 98 (1898).

*Phaca canescens* Hooker & Arnott, Bot. Misc. 3: 185 (1832).—Type from Valparaiso, *Cuming 735*.

*Astragalus canescens* (H. & A.) Gray, Bot. U. S. Explor. Exped. 1: 412 (1854); Reiche, Anal. Univ. Chile 97: 555 (1897), and Fl. Chile 2: 98 (1898). Not DeCandolle (1802).

*Phaca Berteriana* Moris, Mem. Accad. Torino 37: 105, t. 26 (1834).—Type grown in the Botanic Garden at Turin from seeds collected by Bertero.

*Astragalus oblongifolius* Clos in Gay, Fl. Chile 2: 109 (1846).—Type collected along the Rio Cachapoal, Oct. 1828, *Bertero 66*.

*Astragalus sphaerocarpus* Clos in Gay, Fl. Chile 2: 119 (1846). Not Desfontaine (1840).—Type collected in the streets of Santiago, Sept. 1829, *Gay 498*.

*Astragalus placens* var. *oblongifolius* (Clos) Reiche, Anal. Univ. Chile 97: 552 (1897), and Fl. Chile 2: 95 (1898).

*Phaca laxiflora* Philippi, Anal. Univ. Chile 84: 17 (1893).—Type collected near Los Andes.

*Astragalus laxiflorus* (Phil.) Reiche, Anal. Univ. Chile 97: 556 (1897), and Fl. Chile 2: 99 (1898). Not Fischer (1853).

*Phaca dolichostachya* Philippi, Anal. Univ. Chile 84: 21 (1893).—Type from sandy places near Concon, Oct. 1884, *F. Philippi*.

*Astragalus dolichostachys* (Phil.) Reiche, Anal. Univ. Chile 97: 556 (1897), and Fl. Chile 2: 99 (1898).

*Phaca dissitiflora* Philippi, Anal. Univ. Chile 84: 25 (1893).—Type collected at 1700 m. in the valley of the Rio Colorado in Jan. 1888.

*Astragalus laxiflorus* var. *dissitiflora* (Phil.) Reiche, Anal. Univ. Chile 97: 556 (1897), and Fl. Chile 2: 99 (1898). Not Bunge (1859).

*Astragalus aconcaguensis* Spegazzini, Anal. Mus. Nac. Buenos Aires ser. 2, 4: 264 (1902). A new name from *A. laxiflorus* Reiche, not Fischer.

CHILE. Coquimbo: Caimanes, Oct. 1935, *Espinosa* (G); Andocollo, Oct. 1926, *Claude-Joseph* 4532 (US). Aconcagua: Cord. de Norte Ligua, 1902, *Castillo* (G); Quintero, *Werdermann* 24 (G, US, BM, BD); Concon, dunes, Oct. 12, 1884, *Philippi* (G, isotype of *P. dolichostachya*); between Concon and Quintero, Oct. 1928, *Guenther & Buchtien* (Stock); Reñaca, sand hills, 1832, *Bridges* 46 (K); Valparaíso, 1831, *Cuming* 735 (K, type of *P. canescens*); Valparaíso, *Cuming* 734 (K) and 736 (BM), *King* (K) and *Bridges* (BM); San Felipe, 1926, *Claude-Joseph* 3846 and 3850 (US); Santa Rita, 1879, ex *Philippi* as *P. Berteriana* (Speg). Santiago: Colina, 1825, *Macrae* (K); Colina, Oct. 1887, ex *Philippi* as *P. Berteriana* (BM); Chacabuco, ex *Philippi* as *P. Berteriana* (BD); Lampa, *Reed* (K); Lampa, Nov. 1861, ex *Philippi* as *P. Berteriana* (Speg); Tiltill, dry sunny slope, 700 m. alt., *Looser* 728, 737 and 785 (G), *Montero* 149 (G); between Tiltill and Cuesta da La Dormida, 700–1200 m. alt., Oct. 1927, *Looser* 784 (G); streets in Santiago, Sept. 1829, *Gay* 498 (type of *A. sphaerocarpus*, Paris); Cajon del Maipo, *Philippi* as *P. canescens* (BD); near the Rio Maipo, May 1828, *Bertero* 66 (Paris); Rio Colorado, Jan. 1888, *Philippi* (G, isotype of *P. dissitiflora*); Renca, Oct. 1876, ex *Philippi* as *P. Pissisi* (Speg). Colchagua: near the Rio Cachapoal, Oct. 1828, *Bertero* 66 (Paris, type of *A. oblongifolius*; Del). Nuble: Cord. de Chillan, *Philippi* as *P. canescens* (BD). Talca: Curico, Jan. 1928, *Claude-Joseph* 5230 (US).

The type of *A. Berterianus* was grown in Italy from seeds sent by Bertero from Chile. Since Bertero seems to have made only two collections of this species, one near the Rio Maipo in May, 1828 and another near Rancagua along the Rio Cachapoal in Oct. 1828, one of these, probably the former, is the source of the seed he sent to Turin. The latter collection supplied the type of *A. oblongifolius* Clos.

This species varies in the amount of dark hairs on the inflorescence, calyx and fruit. Some plants have a minimum of dark hairs and are light in color, as in the type of *P. canescens*. The color of indument shows no geographical correlation.

8. *Astragalus paposanus* Johnston, Contr. Gray Herb. 85: 51 (1929).—Type from quebrada above Agua Perales, near Paposo, *Johnston* 5586.

RANGE: known only from the vicinity of Paposo and Taltal.

CHILE. Taltal: Quebrada Anchufia, Sept. 1936, *Montero* 2982 (G); Quebrada Guanillo above Agua Perales, near Paposo, Dec. 8, 1925, *Johnston* 5586 (type, G); between Paposo and Punta del Rincon, Nov. 30, 1925, *Johnston* 5564 (G); slopes above El Rincon, dryish ridge above fertile belt, Dec. 7, 1925, *Johnston* 5498 (G).

Very closely related to *A. coquimbensis* and perhaps simply an outlying northern form characterized by a velvety pallid indument.

9. *Astragalus coquimbensis* (H. & A.) Reiche, Anal. Univ. Chile 97: 566 (1897), and Fl. Chile 2: 109 (1898).

*Phaca coquimbensis* Hooker & Arnott, Bot. Misc. 3: 184 (1832).—Type given as from Coquimbo, *Cuming* 864.

*Phaca atacamensis* Philippi, Anal. Univ. Chile 84: 16 (1893).—Type collected at La Brea, Atacama Desert. 1884, *San Roman*.

*Phaca carrizalensis* Philippi, Anal. Univ. Chile 84: 21 (1893).—Type collected near Carrizal Bajo, Atacama, T. King.

*Astragalus vasticola* Johnston, Contr. Gray Herb. 85: 51 (1929).—Based upon *Phaca atacamensis* Phil., not *A. atacamensis* Fries (1905).

RANGE: Deserts along the coast from Coquimbo north towards Taltal.

CHILE. Coquimbo: Coquimbo, *Cuming* 864 (type of *P. coquimbensis*, K); Coquimbo, ex *Philippi*, no. 221, as *P. coquimbensis* (BD). Atacama: Carrizal Bajo, herb. Reed as *P. carrizalensis* (isotype of *P. carrizalensis*, K); near Pique Mostasa, Totoral, 200 m. alt., *Werdermann* 468 (G, K, BD); between Monte Amargo and Caldera, 50 m. alt., *Werdermann* 1636 (BD); Playa Caldera, cerca Morro, Nov. 1936, *Espinosa* (G); near Caldera, *Gigoux* (G); between Caldera and Queb. de Leon, 10 m. alt., *Werdermann* 1638 (G, BD); Chañaral, Sept. 1909, *Reiche* (G); Aguada Grande, *Johnston* 5824 (G, K); indefinite locality, *Geisse* 122 (NY); and *Morong* 1283 (NY). Antofagasta: Aguada Cachina, *Johnston* 5739 (G, K).

An annual species of the coastal desert of northern Chile. It has evident relations only in the closely related *A. paposanus*.

10. *Astragalus curvicaulis* (Clos) Reiche, Anal. Univ. Chile 97: 559 (1897), and Fl. Chile 2: 102 (1898).

*Phaca elata* Hooker & Arnott, Bot. Misc. 3: 185 (1832).—Type from the "Cordillera of Chile" (probably from the upper Aconcagua Valley), *Cuming* 224.

*Astragalus elatus* (H. & A.) Reiche, Anal. Univ. Chile 97: 557 (1897), and Fl. Chile 2: 100 (1898). Not Boiss. & Bal. (1859).

*Phaca curvicaulis* Clos in Gay, Fl. Chile 2: 102 (1846).—Type from "Central Chile" (probably cordilleras of Coquimbo), *Gay*.

RANGE: Higher cordilleras of Aconcagua and Coquimbo and the high coast-ranges east of Limache in the prov. Santiago.

CHILE. Santiago: Las Vizcachas, coast ranges about 8 km. east of La Dormida, 1400–1500 m. alt., open slope, *Morrison* 16819 (G). Aconcagua: Ojos de Agua, *Cruckshank* 92 (K); Juncal, 2200 m. alt., *Buchtien* (G, US, BM, BD); Juncal, 2300–2400 m. alt., 1925, *Pennell* 12975 (G); Rio Blanco, 1950 m. alt., Nov. 1927, *Elliott* 234 (K); Los Andes to Uspallata Pass, *Moseley* (K, BM); cordilleras, *Cuming* 224 (type of *P. elata*, K); locality indefinite, *Bridges* 40 (K, BM); locality indefinite, 1839, *John Style* (Del). Coquimbo: Caren, Queb. Luncuman, 40 km. n. e. of Illapel, ca. 1000 m. alt., in gravel, fl. lavender, *Worth & Morrison* 16496 (G); prov. Coquimbo, *Gay* 876 in part (Del); locality indefinite, *Gay* as *P. curvicaulis* (type of *P. curvicaulis*, Paris; G, K, BD, Del).

The type of *P. curvicaulis* at Paris is given as collected by Gay, but has no number, collection-date, nor locality. It seems very similar to part of *Gay* 876 which consists of a mixture of *A. Looserii* and this species. No locality is given for *Gay* 876 at Paris, but at Geneva it is labeled as from the province of Coquimbo. Since Gay does not appear to have collected in the upper Aconcagua valley, which seems to be the southern limit of the species, it seems probable that he must have obtained his material in the cordillera east of Ovalle or Coquimbo. The type of *P. elata* is simply given as from the Cordilleras of Chile. *Cuming*, its collector, is known to have collected in the upper Aconcagua valley where the species is best



known, and it is practically certain that his material must have come from that area. The var.  $\beta$  mentioned by Hooker & Arnott, l.c., based upon *Cuming* 734 represents *A. Berterianus*. The present species is a very distinct one, unique in its firm strict elongate lancoid pods. It has been confused with *A. Looserii* but is readily distinguished from that species by its much larger more inflated and rounded fruit, smaller flowers, scanty short pale, rather than dense conspicuous black indument on the ovary, fruit and calyx, and cinereous rather than green juvenile leaves.

11. *Astragalus pehuenches* Niederlein in Roca, Exped. Rio Negro 2: 206, t. 4, (1881).

— Type collected between Pampa de Tilqui and Pampa de Trili, Neuquen, *Niederlein*.

*Phaca inflata* Gillies ex Hooker & Arnott, Bot. Misc. 3: 183 (1832). — Type from between Mendoza and Uspallata on the road to Canota, *Gillies*.

*Astragalus inflatus* Gillies ex Steudel, Nom. ed. 2, 1: 161 (1840). Not DeCandolle (1802).

*Phaca striata* Clos in Gay, Fl. Chile 2: 93 (1846). — Type from Andes de la Dehesa, prov. Santiago, Nov. 1829, *Gay* 926.

*Astragalus striatus* (Clos) Reiche, Anal. Univ. Chile 97: 570 (1897), and Fl. Chile 2: 113 (1898). Not Nuttall (1840).

*Phaca macrocarpa* Philippi, Linnaea 28: 619 (1857). — Type from the Cordillera de San Fernando, Feb. 1843, *Bustillos*.

*Astragalus macrocarpus* (Phil.) Reiche, Anal. Univ. Chile 97: 563 (1897), and Fl. Chile 2: 106 (1898). Not Pallas (1776), nor DeCandolle (1802).

*Tragacantha bisinflata* Kuntze, Rev. Gen. 2: 940 (1891). — Based upon *P. inflata* *Gillies*.

*Tragacantha grandis* Kuntze, Rev. Gen. 2: 941 (1891). — Based upon *P. macrocarpa* *Phil.*

*Astragalus grandis* (Kuntze) Spegazzini, Rev. Argent. Bot. 1: 214 (1926).

*Astragalus megalocarpus* Spegazzini, Anal. Mus. Nac. Buenos Aires ser. 2, 4: 265 (1902). — Based upon *A. macrocarpus* *Reiche*, not *Pallas*.

*Astragalus macrocarpus* var. *petiolatus* Hauman, Anal. Soc. Cien. Argentina 86: 280 (1918-19). — Type from Puente del Inca, *Sanzin* 349.

RANGE: Chilean cordilleras from southern Coquimbo to Talca; Argentine cordilleras from southernmost San Juan south to northern Neuquen and eastward on the desert lowlands into central La Pampa and northern Rio Negro.

CHILE. Coquimbo: Cuncumén, Rio Choapa, ex *Philippi* (BD). Santiago: Andes de la Dehesa, Nov. 1829, *Gay* 926 (type of *P. striata*, Paris); Las Condes, *herb. Reed* (G, K). Colchagua: Baños del Flaco, 1937, *Espinosa* (G); Val Tinguiririca, 1600 m. alt., 1897, *Wilczek* 87 (Boiss). Talca: Cuesta Vergara, ca. 2300 m. alt., Jan. 1933, *Grandjot* (Grandjot); above Los Queñes, 1240 m. alt., 1936, *Mexia* 7859 (G); Cord. de Curico, 1800 m. alt., Jan. 1897, *Reiche* (BD).

ARGENTINA. San Juan: Valle de la Rio Penitentes, Caleta Bicrak, March 1883, *Güssfeldt* (BD). Mendoza: Valle de Canota, *Gillies* (K); between Uspallata and Paramillo de Canota, gravelly soil in valley, *Gillies* (K); valleys between Mendoza and Uspallata by road of Canota, *Gillies* (type of *P. inflata*, K); La Loma del Agua de los Cielos, *Gillies* 269 (G, K); Cajon de las Aguas, upper Rio Salado, Jan. 27, 1893, *Kurtz* 7618 (NY); Los Molles, upper Rio Salado, Jan. 5, 1893, *Kurtz* 7487 (NY); near La Quebrada, Dec. 1933, *Ruiz Leal* 1836 (G); Paso de la Cruz de Piedra, 1500 m. alt., *Kuntze* (NY, US, BD); Malargue, *Monticelli* E 71 (G). La Pampa: Puelén, *Durando* (G); Gob. de la Pampa, 1932, *un cura* (*Burkart*). Neuquen: between the pampas of Tilqui and Trili, rare in gypsum-soil, ca. lat. 37°, long. 70°, June 26, 1879, *Niederlein* (type of *A. pehuenches*, BD). Rio Negro: Choele-choel, Dec. 1907, *herb. Spegazzini* (Speg); campo between Rio Colorado and Rio Negro, Jan. 1903, *herb. Spegazzini* (Speg). Indefinite: Patagonia, lat. 50°-53°, *Moreno & Tonini* 438 (NY).

A coarse spreading herbaceous plant with glabrous fruits and ovary. In its large spreading or pendulous papery pods it suggests *A. Darumbium*, but that plant has smaller flowers, a strigose ovary and fruit and a more erect habit of growth.

12. *Astragalus valerianensis* Johnston, Contr. Gray Herb. 85: 166 (1929).—Type from Rio Valeriana near La Cueva, 1926, *Johnston 6033*.

RANGE: Cordilleras of southeastern Atacama.

CHILE. Atacama: Rio Valeriano near La Cueva, cordillera east of Vallenar, 2800 m. alt., loamy talus slope, *Johnston 6033* (type, G).

A plant somewhat suggesting the montane forms of *A. Darumbium* but quickly distinguished by its glabrous ovary and fruit, strict stems, pedicels 4–6 mm. long, and detached more northerly occurrence. It is probably most closely related to *A. pehuenches*, but differs from that plant in its evidently strigose herbage, more slender and strict stems, and larger pods.

13. *Astragalus vagus* (Clos) Reiche, Anal. Univ. Chile 97: 563 (1897), and Fl. Chile 2: 106 (1898).

*Phaca vaga* Clos in Gay, Fl. Chile 2: 99 (1846).—Type from Pasto Blanco, cordilleras east of Coquimbo, *Gay 364*.

*Astragalus Echegarayi* Hieronymus, Bol. Acad. Nac. Cordoba 4: 22 (1881).—Type from Paramillo, west of San Juan, *Echegaray*.

*Astragalus striatus* var. *Echegarayi* (Hieron.) Hosseus, Bol. Acad. Nac. Cordoba 26: 156 (1922).

*Phaca San Romani* Philippi, Anal. Univ. Chile 84: 18 (1893).—Type from Queb. Seca, cordillera de Atacama, lat. 27° 55', long. 69° 10', *San Roman*.

*Astragalus San Romani* (Phil.) Reiche, Anal. Univ. Chile 97: 559 (1897), and Fl. Chile 2: 102 (1898).

RANGE: Higher cordilleras in the provinces of Atacama, Coquimbo and San Juan.

CHILE. Atacama: Cerro Cadillal, Cord. Rio Turbido, 3200 m. alt., *Werdermann 962* (G, K, BD); higher parts of Queb. de San Miguel, about alkaline flats and along dry stream-ways, 2800 m. alt., *Johnston 4922* (G, US, K); Rio Laguna Grande, 3800 m. alt., *Werdermann 244* (G, K, BD); Laguna Grande, in gravel, fl. pinkish, somewhat purplish at base, 3250 m. alt., *Johnston 5918* (G); Laguna Chica, in gravel, fl. white to flesh-colored, 3200 m. alt., *Johnston 5971* (G); Rio Sancarron below Rucas, gravelly bench, fl. pink to magenta, 3200 m. alt., *Johnston 6205* (G, K). Coquimbo: Pasto Blanco, Cord. de Elqui, 2837 m. alt., *Gay 364* (type of *P. vega*, Paris; G, K, BD, Del).

ARGENTINA. San Juan: Paramillo, Jan. 1876, *Echegaray* (type of *A. Echegarayi*, BD).

This appears to be the most common *Astragalus* with inflated pods found in the cordilleras of Atacama and Coquimbo. It may be related to *A. coquimbensis*, which occurs at low altitudes west of the cordilleras, but differs from that annual in its strong perennial root and somewhat smaller capitately congested pods. When I examined the type of *A. Echegarayi* I identified it with *A. vagus*, but subsequently as my studies of the genus progressed I have come to wonder if it might not really be a form of *A. monticola*. *Phaca San Romani*, however, is unquestionably a synonym of the present species.

14. *Astragalus Darumbium* (Bertero) Clos in Gay, Fl. Chile 2: 112 (1846).

*Sutherlandia Darumbium* Bertero ex Colla, Mem. Accad. Torino 37: 55 (1834).—Type from near Rancagua, *Bertero*.

*Phaca macrophysa* Philippi, Linnaea 28: 620 (1857).—Type from Las Arañas mine, Cord. de Santiago, Oct. 1853, *Philippi*.

*Astragalus macrophysus* (Phil.) Reiche, Anal. Univ. Chile 97: 554 (1897), and Fl. Chile 2: 106 (1898). Not Somm. & Levier (1893–94).

*Phaca robusta* Philippi, Anal. Univ. Chile 41: 690 (1872).—Type from the Cord. de Santiago.

*Astragalus macrophysus* var. *robustus* (Phil.) Reiche, Anal. Univ. Chile 97: 554 (1897), and Fl. Chile 2: 106 (1898).

*Tragacantha firma* Kuntze, Rev. Gen. 2: 941 (1891).—Based on *P. robusta* Phil.

*Astragalus atuelii* Chodat & Wilczek, Bull. Herb. Boiss. ser. 2, 2: 477 (1902).—Type from Arroyo Manga, Valle del Atuel, 1897, *Wilczek 86*.

RANGE: Cordilleras of Santiago and Colchagua and adjacent Mendoza.

CHILE. Santiago: Cerro Provincia, 2100–2500 m. alt., 1932–33, *Grandjot* (*Grandjot*); Valle de Ramon, 2200 m. alt., Feb. 1933, *Grandjot* (*Grandjot*); Valle de la Hierba Loca, 2300 m. alt., 1932, *Grandjot* (*Grandjot*); Manquehue, Oct. 11, 1908, *Rudolpho* (G); Las Arañas, Cord. de Santiago, Oct. 1853, *Philippi* (isotype of *P. macrophysa*, G); Cord. de Santiago, ex *Philippi* as *P. macrophysa* (BD). Colchagua: Baños de Cauquenes, Dec. 1901, *Elwes* (K); in sand along the Rio Cachapoal near San Joaquin, perhaps from seeds washed down from the cordilleras, 1829, *Bertero 679* (isotype of *S. Darumbium*, Paris, Del, BD, BM); Rancagua, Dec. 1828, *Bertero 679* (Del).

ARGENTINA. Mendoza: Arroyo Manga, Valle del Atuel, in sand and about rocks, 1900 m. alt., 1897, *Wilczek 86* (type of *A. atuelii*, Boiss).

The type of *A. Darumbium* is a very rank plant with coarse decumbent stems becoming 1 m. long and 7 mm. thick. It was discovered along a stream at the base of the cordilleras and thought to be a possible waif washed down from higher altitudes in the mountains ("fortasse semina ex cordillera provenant"). Similar very coarse plants have not been rediscovered. A very closely related plant, however, has been found in the cordilleras and described as *P. macrophysa*, *P. robusta* and *A. atuelii*. This latter has shorter more slender stems, smaller leaves, perhaps shorter pedicels and larger black-hairy pods. The most reduced form is *P. macrophysa*. Apparently intermediate between this and the type of *A. Darumbium* is *P. robusta*. The indument on all these forms varies from sparsely to very densely strigose, some plants appearing glabrous at first sight while others are obviously silky with abundant appressed hairs.

When *A. atuelii* was originally described the type was given as from 900 m. altitude and as representing Wilczek's collection no. 372. The label on the type at Geneva, however, gives the altitude as 1900 m. and the collection number as 86.

The species is related to *A. monticola* and, in fact, grows with it in the cordilleras east of Santiago. It is distinguished from this relative by its usually larger fruit, slightly more elongate calyx, and silky appressed indument. Some of the montane forms have a root that is much more slender than in other cordilleran species of this general relationship, and in gross habit frequently suggest forms of *A. coquimbensis* and *A. paposanus*. The two latter species, however, are not closely related to our plant and are readily distinguished by having pink rather than violet or purple corollas.

15. *Astragalus monticola* Philippi, Linnaea 33: 47 (1864); Reiche, Anal. Univ. Chile 97: 549 (1897); and Fl. Chile 2: 92 (1898).—Type collected near the silver mines of Las Arañas, Cord. de Santiago, *Philippi*.

*Astragalus* ? *Barceloi* Philippi, Anal. Univ. Chile 84: 27 (1893); Reiche, Anal. Univ. Chile 97: 566 (1897), and Fl. Chile 2: 109 (1898).—"Ex Andibus chillanensibus, ni fallor, provenit."

RANGE: Cordilleras of Santiago and San Juan.

CHILE. Santiago: Las Arañas, Nov. 1861, *Philippi* (type of *A. monticola*, Santiago); Mina Disputada, Cord. de los Condes, 3500 m. alt., *Father Deny Le Manchee* 258 (G); Mina Disputada, 2500–2600 m. alt., April 1933, *Grandjot* (Grandjot); Valle de la Hierba Loca, 2000–2300 m. alt., Nov. 1932, *Grandjot* (Grandjot); Valle Largo de las Condes, 2600 m. alt., Jan. 1934, *Grandjot* (Grandjot); Cerro Provencia, 2100 m. alt., Nov. 1933, *Grandjot* (Grandjot); Potrero Grande, 2160 m. alt. Dec. 1933, *Behn* (G).

ARGENTINA. San Juan: between Tudeum and Queb. de Conconta, Jan. 1, 1930, *Perez Moreau* 30/105 (G).

A species evidently related to the montane form of *A. Darumbium* and differing from it chiefly in having dull spreading, rather than silky closely appressed hairs on the leaves, stems and fruit. Though *A. monticola* and *A. Darumbium* sometimes grow together (Dr. Grandjot collected them both at Valle de Hierba Loca and at Cerro Provencia) they maintain their characters and are readily separable. The type of *A. Barceloi*, as Philippi suspected, is almost certainly mislabeled. The label on the type at Santiago reads "*Astragalus Barceloi*, Cord. de Chillan?," but the specimen agrees closely with the material I have cited from the cordilleras east of Santiago and I believe probably originated there.

16. *Astragalus vesiculosus* Clos in Gay, Fl. Chile, t. 17 (1844), and Fl. Chile 2: 120 (1846); Weddell, Chlor. Andina 2: 261 (1861); Reiche, Anal. Univ. Chile 97: 559 (1897), and Fl. Chile 2: 102 (1898).—Type from Cord. de los Patos, *Gay* 488. *Phaca nubigena* Meyen ex Vogel, Verhandl. K. Leop.-Carol. Akad. Naturf. 19: suppl. pg. 16 (1843).—Type from 2400 m. alt. in the Cord. de San Fernando, *Meyen*. *Astragalus nubigenus* (Meyen) Taubert in Engler & Prantl, Nat. Pflanzenf. iii. Abt. 3: 303 (1894); Reiche, Anal. Univ. Chile 97: 560 (1897), and Fl. Chile 2: 103 (1898). Not Don (1825).

*Phaca Bustillosi* Philippi, Linnaea 28: 680 (1857).—Type from the Cord. de San Fernando, *Bustillos*.

*Tragacantha andina* Kuntze, Rev. Gen. 2: 940 (1891).—Based upon *P. Bustillosi* Phil.

*Astragalus nubigenus* var. *Arnottianus* Meyen ex Reiche, Anal. Univ. Chile 97: 561 (1897), and Fl. Chile 2: 104 (1898).—Based upon "*Phaca Arnothiana* Hook." sensu Meyen, Reise 1: 356 (1834); i.e., Rio Maipo, 11000 ft. alt., *Meyen*.

*Astragalus rupestris* Reiche, Anal. Univ. Chile 97: 562 (1897), and Fl. Chile 2: 105 (1898).—Based upon *Phaca Bustillosi* Phil.; not *Astragalus Bustillosii* Clos.

*Astragalus Meyenianus* Spegazzini, Anal. Mus. Nac. Buenos Aires 7: 262 (1902).—Based upon *Astragalus nubigenus* Taubert; not *A. nubigenus* Don.

*Astragalus Ameghinoi* Spegazzini, Anal. Mus. Nac. Buenos Aires 7: 262 (1902).—Type from between San Julian and Rio Deseado, Santa Cruz, *Ameghino*.

*Astragalus Meyenianus* var. *paucifoliolata* Hicken, Darwiniana 1: 56 (1923).—Type from Cajon del Burro, Rio Atuel, *Gerth* 102 and 106a.

RANGE: From the provinces of San Juan and Coquimbo southward along the higher Andes to Mendoza and Talca, and with outlying stations in Chubut and Santa Cruz.



CHILE. Coquimbo: crest of the high cordilleras of Los Patos, 3340 m. alt., Gay 488 (Paris, type of *A. vesiculosus*); Cerro la Yerba Loca, east of La Vega Escondido, dept. Illapel, 2800-3450 m. alt., fl. blue and white, Dec. 1938, Morrison 16932 (G). Aconcagua: near Junta de Pinquenes, Río Sobrante, dept. Petorca, rocky slopes, 3500-3700 m. alt., fl. blue-purple, Morrison 17284 (G). Santiago: Cord. de Santiago, 3500 m. alt., Feb. 1899, Reiche as *A. Bustillosii* (BD); Cord. de Santiago, 1899, ex Philippi as *A. rupestris* (BM); Cajon del Cepo, Cord. Santiago, 2900 m. alt., Feb. 22, 1894, Dessauer (Munich); above Laguna Negra, 3300 m. alt., 1902, Hastings 498 (US); Río Maipo [upper Río del Volcan!] 3300 m. alt., Feb. 1831, Meyen as *P. Arnottiana* (BD, type of *A. nubig.* var. *Arnottianus* Reiche); Paso de Maipo, Jan. 1883, Güssfeldt (BD); Paso de la Cruz Piedra, 2300 m. alt., Jan. 1892, Kuntze (NY, BD, US). Colchagua: Cord. Tinguiririca, east of Rengo, 2200 m. alt., 1930, Pirion 702 (G); El Teniente, Río Coya, 2800 m. alt., 1925, Pennell 12317 (G); Cord. de San Fernando, Feb. 1843, herb. Philippi as *P. Bustillosii* (? type of *P. Bustillosii*, Santiago); Cord. de San Fernando, Meyen (BD, type of *P. nubigena*); Cord. del Río Tinguiririca, 2400 m. alt., Feb. 1831, Meyen as *P. nubigena* (BD). Talca: near Volcan Peteroa, Bridges 1129 (K); Santa Elena, Cord. de Curico, Feb. 1902, Flaminio Ruiz (G).

ARGENTINA. San Juan: crest east of Carrisito (Río Blanco), ca. 3200 m. alt., Nov. 17, 1915, Hosseus 1448 (BD). Mendoza: Punta de Vacas, March 1901, Spegazzini (Speg); "La Cumbre, Las Cuevas," Dec. 1908, Spegazzini (Speg); Paso del Portillo, 3500-4000 m. alt., Ruiz Leal 1985 and 2110 (G); Paso Hondo, Valle Río Tunuyan, Ruiz Leal 2064 (G); Río Tordillo, Piedra del Burrero, ca. 2900 m. alt., 1897, Wilczek 105 (Boiss, US); Cajon del Burro, ca. 2900 m. alt., Wilczek 104 (Boiss, US); Cerro de los Guanacos, 2600 m. alt., Jan. 1921, Carrette 227 (G); Mala Dormida, 2700 m. alt., Jan. 1921, Carrette 238 (LP). Chubut: Valle de Laguna Blanca, Koslowsky 177 (K). Santa Cruz: between San Julian and Río Deseado, 1899, Ameghino (Speg, type of *A. Ameghinoi*).

This species is best known from the cordilleras about the headwaters of the Río Maipo. Though apparently with a rather disrupted distribution it is a very distinct and readily recognizable species, characterized by its grayish loose indument, broad crowded obcordate leaflets, small frequently pale corollas and firm rounded inflated hairy pods.

Among the synonyms cited above, only *A. Ameghinoi* deserves special mention. The type of this species comes from southern Patagonia, far to the south of the principal range of *A. vesiculosus*. In appearance and all vegetative and habit characters it is similar to *A. vesiculosus*. The fruit, however, is small (ca. 1 cm. long), rigid, and very densely and conspicuously hairy. It is, however, not thoroughly ripened, and I suspect that some or all of these differences may be associated with immaturity. Concerning *A. Ameghinoi* it may be noted that of the two collections cited by Spegazzini the one from the Golfo de San Gorge is a very immature specimen of *A. Dusenii* showing flower-buds only.

17. *Astragalus Arnottianus* (Gillies) Reiche, Anal. Univ. Chile 97: 561 (1897), and Fl. Chile 2: 104 (1898).

*Phaca Arnottiana* Gillies ex Hooker & Arnott, Bot. Misc. 3: 184 (1832).—Type material from El Cerro de la Polcura and Las Lefas, Mendoza, Gillies.

*Phaca uspallatensis* Philippi, Anal. Univ. Chile 36: 168 (1870).—Type collected between Mendoza and Uspallata.

*Phaca Reedii* Philippi, Anal. Univ. Chile 36: 168 (1870).—Type from the eastern side of Paso del Portillo, Mendoza, Reed.

*Astragalus Reedii* (Phil.) Hauman, [Veg. Hautes Cord. 127] Anal. Soc. Cien. Argentina 86: 281 (1918).

*Phaca nana* Philippi, Anal. Univ. Chile 84: 19 (1893). — Type from Cordillera del Peuco, prov. Colchagua.

*Astragalus nanus* (Phil.) Reiche, Anal. Univ. Chile 97: 569 (1897), and Fl. Chile 2: 112 (1898). Not DC (1802).

*Astragalus Philippi* Spegazzini, Anal. Mus. Nac. Buenos Aires iv. 4: 265 (1902). — Based on *P. nana* Phil.

RANGE: Along the higher cordilleras from Coquimbo and La Rioja southward to Mendoza and Colchagua.

CHILE. Coquimbo: between Guanta and Baños del Toro, *Reed* (K); Estero de Guanta, 3500 m. alt., *Johnston* 6252 (G, US). Aconcagua: upper Rio Aconcagua, 3600 m. alt., *Gosse* (K); Caracoles, *Jaffuel* 3508 (G); Juncal, 2300 m. alt., 1913, *Buchtien* (G, US, BM, BD). Santiago: Cajon de Esmeralda, 1900, *J. Philippi* (G); Valle del Yeso, *Reed* (K); Laguna Negra, Feb. 1901, *Ayarzum* (BM). Colchagua: El Teniente, Rio Coya, 2800 m. alt., *Pennell* 12337 (G); Cord. del Peuco, 1886, *herb. Philippi* (type of *P. nana*, Santiago).

ARGENTINA. La Rioja: Queb. Descubrimiento Nuevo, *Hosseus* 1398 (BD). Mendoza: Cord. del Tigre, 2500 m. alt., *King* 323 (BM); Cumbre de Uspallata, 3600 m. alt., *Wilczek* 103 (Boiss); Puente del Inca, *King* 12 (K); Las Cuevas, *Hosseus* 2152, 2168 and 2230 (BD); Paramillo de las Cuevas, 3800 m. alt., *Bettfreund* 261 (BD); Punta de Vacas, *King* 690 (BM); Queb. Benjamin Matienzo, Las Cuevas, *Perez Moreau* 12632 (G); Las Leñas, *Gillies* (K); Las Leñas and El Cerro de la Polcura, *Gillies* (type of *P. Arnottiana*, K); Queb. de las Cauteras, Las Heras, 1200–1600 m. alt., *Semper* 4222 (G); Valle de las Relinchos, 3400–3600 m. alt., *Semper* 4921 and 4922 (G); Tres Quebradas, Tupungato, 2840 m. alt., *Ruiz Leal* 3613 (G); precord. near Rincon Colorado, Tunuyan, 2500–3000 m. alt., *Ruiz Leal* 1307 (G); near Cuesta de los Aflijidos, Cord. del Portillo, *Ruiz Leal* 1876 and 1876 A–B (G).

A well known and readily recognized species of the central cordilleras of Argentina and Chile. In its area it is the only species with mottled, glabrous, inflated pods. It appears to be common in the Andes of Mendoza below Uspallata Pass. From this area came the type of *A. Arnottianus*. Also from this region came the plants discussed and well illustrated (as *A. oreophilus*) by Hauman, [Veg. Hautes Cord. 126] Anal. Soc. Cien. Argentina 86: 280, t. 24, f. 4–5 (1918).

The species is evidently related to *A. palenae* which occurs along the cordilleras further to the south. From this relative *A. Arnottianus* is distinguished by having the leaflets more or less evidently strigose on the upper surface and the wings of the corolla always conspicuously longer than the keel. The fruit is always glabrous. At high altitudes the species becomes reduced in size and very compact in habit. One of these dwarfed extremes appears to be that described by Philippi as *Phaca Reedi*.

18. *Astragalus palenae* (Phil.) Reiche, Anal. Univ. Chile 97: 542 (May 1897), and Fl. Chile 2: 85 (1898); Spegazzini, Rev. Fac. Agron. y Vet. La Plata 3: 600 (Sept. 1897).

? *Phaca oreophila* Philippi, Linnaea 28: 681 (1857). — Type collected by Germain in the cordilleras east of Linares, prov. Maule.

? *Astragalus oreophilus* (Phil.) Reiche, Anal. Univ. Chile 97: 561 (1897), and Fl. Chile 2: 104 (1898).

*Phaca palenae* Philippi, Anal. Univ. Chile 84: 23 (1893). — Type from the Valley of the Rio Palena, ca. lat. 44° S., *F. Delfin*.

*Phaca Rahmeri* Philippi, Anal. Univ. Chile 84: 23 (1893). — Type from Laguna de Gualletué, prov. Gautin, 1887, *Rahmer*.

*Astragalus Rahmeri* (Phil.) Reiche, Anal. Univ. Chile 97: 542 (1897), and Fl. Chile 2: 85 (1898).

*Astragalus pallens* Reiche ex K. Schum. in Just, Bot. Jahresber. 261: 352 (1900), lapsu calami.

*Astragalus palenae* var. *grandiflora* Spegazzini, Anal. Mus. Nac. Buenos Aires, ser. 2, 4: 267 (1902).—Type collected by Spegazzini near Lago Nahuel-huapi.

RANGE: Along the cordilleras from Neuquen and Cautin (and possibly Maule) southward to the drainage of the Rio Palena and Chubut.

CHILE. ?Maule: cord. Maule, *Germain* as *A. vesiculosus* (K, BM, Del). Cautin: "Araucania" [?Laguna de Gualletué, upper Bio Bio] ex *Philippi* as *P. Rahmeri* (K, BD).

ARGENTINA. Neuquen: San Martin de los Andes, 720 m. alt., *Comber* 791 (K); Zapala district, *Opozo sub Comber* 1160 (K); Pino Hachado, 2000 m. alt., 1920, *Parodi* 2038 in pt. (Parodi). Rio Negro: Puerto Americano near Bariloche, 1928, *Rafael Cordini* 194 (US); Bariloche, 1934, *Burkart* 6277 (G); Sierra Gutierrez, Bariloche, 1400 m. alt., 1905, *Buchtien* 21 (US); near Lago Nahuel-huapi, Dec. 1897, *Spegazzini* (Speg, type of var. *grandiflora*). Chubut: near Carren-leofu, 1901, *Illin* (Speg); near Carren-leofu, 1889, *Moyano* (Speg); Pampa Chica, Nov. 12, 1908, *Skottsberg* 567 (Stock); Chubut, Dec. 1897, *collector?* (Speg); Patagonia, *Moreno & Tonini* 439 as *Trag. Cruckshanksii* (NY).

18a. *Astragalus palenae* var. *Duseni* (Macloskie), comb. nov.

*Astragalus brevicaulis* Dusen, Sven. Exped. Magell. 3: no. 5, pg. 158 (1900).—

Type from Cabo Domingo, eastern Fuegia, *Dusen*.

*Astragalus Duseni* Macloskie, Fl. Patagonia 2: 962 (1906).—Based upon *A. brevicaulis* Dusen (1900), not Nelson (1899).

RANGE: Eastern Fuegia northward to southwestern Chubut.

ARGENTINA. Santa Cruz: Killik Aike, Rio Gallegos, 1900, *Brown* 21 and 54 (NY); Cape Fairweather, mouth of Rio Gallegos, *Capt. King* (K, BM); Rio Coyle, Estab. Las Vegas, 1916, *Dauber* 130 (Parodi); Puerto Santa Cruz, Dec. 1904, *Dusen* 5481 (Stock); Rio Santa Cruz, 1882, *Spegazzini* (Speg); Lago Argentino, *Furlong* 81 (G, NY, K); Burmeister Peninsula, Lago Argentino, *Prichard* (BM); Lago San Martin, 1903, *collector?* (Speg); San Julian, 1833, *Henslow* 80 (K); San Julian, 1904, *Dusen* (Stock); San Julian, 1931, *Blake* 2, 172 and 180 (K); Golfo de San Jorge, Feb. 1896, *Ameghino* (Speg, as *A. Ameghinoi*). Chubut: Rio Aysen, Dec. 1900, *collector?* (Speg); Lago Blanco, Dec. 1903, *collector?* (Speg); Chubut, Jan. 1898, *collector?* (Speg).

Among the species with inflated fruit the present species is characterized by its austral distribution, its folded leaflets that are glabrous above, and its corolla-wings which are shorter than the keel or barely surpass it. Typical *A. palenae* comes from the valley of the Rio Palena (or the Rio Carren-leofu as it is called within Argentine). This form has the wings of the corolla evidently surpassed by the keel. The corolla is about 11 mm. long. Further north, about Lake Nahuel-huapi and the headwaters of the Rio Bio Bio, a coarser form is common. This has larger leaflets and coarser (13–16 mm. long) corollas and is represented by the type of the var. *grandiflora* Speg. I have accepted this variety as a luxuriant form of the species. Typical *A. palenae* is known from the same general region in which the variety has been found.

Beginning in southwestern Chubut and extending to Fuegia there are plants that agree well with typical *A. palenae* except that the wings and keel are subequal. These plants represent the variety *Duseni*. In the collection cited from Lago Blanco half of the plants in it have corollas of typical *A. palenae* and the other half those of the var. *Duseni*. They are

otherwise indistinguishable. The ovary and fruit of *A. palenae* and its var. *Dusenii* are usually glabrous. As exceptions to this general rule, however, there is to be noted a collection from San Julian (*Blake 180*) in which some of the plants have glabrous and the others have densely strigose ovaries. A collection (Chubut, Jan. 1898) in the Spegazzini Herbarium has the ovaries and also mature fruit conspicuously strigose.

I have seen no authentic material of *Phaca oreophila* but I suspect that it may represent what is here treated as *A. palenae*. The descriptions of *A. oreophilus* given by Philippi and by Reiche seem to apply equally well to both *A. Arnottianus* and *A. palenae*. The type of *A. oreophilus* unfortunately lacks corollas. It came from the cordilleras above Linares in what is now the province of Maule. Should *A. oreophilus* prove actually conspecific with *A. palenae* then the former name, being older, must be taken up as the correct appellation for the concept here treated.

It is possible that the species may have another old name in *Phaca quindecimjuga* Phil. (1862), which was based on collections said to be from the cordilleras of Coquimbo though perhaps actually from the mountains of southern Chile. Further details regarding *P. quindecimjuga* will be found in the discussion of unplaced species.

19. *Astragalus argentinus* Manganaro, Anal. Soc. Cien. Argentina 87: 145, fig. 14 (1919).—Original collections from Sierra del Tandil, Sierra Peregrina and Sierra de Curamalal.

RANGE: Known only from the mountains in the southern half of the province of Buenos Aires.

ARGENTINA. Buenos Aires: Sierra de la Ventana, Nov. 1904, *Dusen 6279* (Stock); Pueblo Tornquist, Dec. 21, 1899, *collector not given* (Speg).

Though this very well marked local species was compared with *A. Bergii* by Manganaro, it certainly cannot be closely related to that plant. While showing evident differences in the proportions of its flowers, *A. argentinus* reveals its obvious relations with *A. Cruckshanksii* in its tough leathery fruit and salient pod-sutures.

20. *Astragalus Illinii*, nom. nov.

*Astragalus Moyanoi* var. *villosula* Spegazzini, Anal. Mus. Nac. Buenos Aires 7: 267 (1902).—Type from along the Rio Carren-leofu, 1900, *Illin*.

RANGE: Known only from Chubut.

ARGENTINA. Chubut: Carren-leofu, 1900, *N. Illin* (Speg, type); Chubut, 1903, *collector ?* (Speg).

A species apparently most closely related to *A. Cruckshanksii* but differing conspicuously in its indument and fruit. The leaves, fruit, and younger parts of the plant are canescent with a subtomentose indument of very slender loosely appressed hairs 1–2 mm. long. The angularly subovate or subglobose fruit is evidently higher (dorso-ventrally) than long or thick. It usually measures  $10 \times 6 \times 6$  mm. The valves though highly convex are compressed at their very margin. This consequently elevates the keel which encircles the fruit. The fruit is one-celled and has no false septum. When mature it is tough, rigid and filled with seeds.



21. *Astragalus Cruckshanksii* (H. & A.) Grisebach, Abhand. K. Ges. Wiss. Goettingen 24: 103 (1879), as "*A. Cruikschankii*"; Reiche, Anal. Univ. Chile 97: 558 (1897), and Fl. Chile 2: 101 (1898).

*Phaca Cruckshanksii* Hooker & Arnott, Bot. Misc. 3: 184 (1832); Philippi, Linnaea 33: 41 (1864).—Type collected by Cruckshank between Tambillos and Puente de Inca, cordillera of Mendoza, not in the "cordilleras of Chile" as originally given!

*Phaca Landbecki* Philippi, Linnaea 33: 42 (1864).—"In Andibus prov. Colchaguae legit orn. Landbeck."

*Astragalus Landbecki* (Phil.) Reiche, Anal. Univ. Chile 97: 562 (1897), and Fl. Chile 2: 105 (1898).

RANGE: Cordilleras from Atacama and Mendoza south to Colchagua and Neuquen.

CHILE. Atacama: Queb. Alfalfa, dept. Vallenar, 3200 m. alt., *Johnston 5991* (G, K); Rio Valeriano at Juntas del Encierro, 3200 m. alt., *Johnston 6015* (G, US); Los Cuartitos, 3420, *Johnston 6228* (G). Coquimbo: Baños del Toro, 3500 m. alt., *Werdermann 202* (G, BM, BD); high cordilleras of Los Patos, 2537 m. alt., *Gay 487* (Paris); Las Hediondas, Baños del Toro, 1938, *Espinosa* (G). Aconcagua: El Peñon, *Poeppig 99/18* (BD, Paris); Juncal, 2100 m. alt., *Elliot 164* (K); Las Calaveras, 3100 m. alt., *Buchtien 1195* (G, US, BM, BD); cordilleras, *Cuming 319* (K, BM). Santiago: Cord. de la Dehesa, Nov. 1929, *Gay 533* (Paris); Valle Ramon, 2800 m. alt., Feb. 1933, *Grandjot* (Grandjot); Potrero Grande, 2200 m. alt., Dec. 1933, *Grandjot* (G); Valle Engorda, 2400 m. alt., March 1933, *Grandjot* (Grandjot); near San Gabriel, Maipo valley, 3000 m. alt., *Grandjot 3586* (G). Colchagua: Baños El Flaco, Cajon de Las Damas, Cord. San Fernando, 1800 m. alt., Dec. 1936, *Milner* (Behn); Cord. de Colchagua, 2000 m. alt., Jan. 1930, *Pirion 94* (G); Cord. de Colchagua, 3000–3600 m. alt., Dec. 1860, *Landbeck* (type of *P. Landbecki*, Santiago).

ARGENTINA. Mendoza: Cord. del Tigre, 2500 m. alt., *King 322* (K); between Tambillos and Puente del Inca, *Cruckshank 94* (type of *P. Cruckshanksii*, Kew) and *Perez Moreau 12628* (G); Puente del Inca, *Malme 2817* (US); Las Cuevas, *Perez Moreau 12633* (G); Cerro del Diamante and Cerro de la Polcura, *Gillies* (K); Cerro de los Aflijidos, *Ruiz Leal 1877* (G); Real de Contreras, Valle Tunuyan *Ruiz Leal 2120* (G); Valle Tunuyan, *Ruiz Leal 1925* (G); Los Guanacos, 2000 m. alt., *Carette 3000* (LP); Mala Dormida, 2700 m. alt., *Carette 240* (G); Cajon del Burro, Valle Atuel, 2900 m. alt., *Wilczek 115* (Boiss, US); Piedra del Burrero, 2900 m. alt., *Wilczek 118* (Boiss, US); Paso de la Cruz Piedra, 2500 m. alt., *Kuntze* as *T. Philippiana* (NY). Neuquen: Liu Cullin, 1350, *Comber 309* (K); Pino Hachado, *Parodi 2198* (Parodi); Vega Lolog, 810 m. alt., *Comber 824* (K).

As here defined the name *A. Cruckshanksii* is restricted to the well known and characteristic plant of middle altitudes in the central Andes of Chile and Argentina. It is closely related to *A. Amunategui* and, in the southern parts of its area, perhaps intergrades with that more southerly and easterly ranging species. It differs from its relative in its more distinctly montane habitats, its prevailingly prostrate stems, and its elliptic or oblanceolate obtuse or emarginate leaflets. The species was first collected and is best known along the road to Uspallata Pass in Mendoza. Plants from the area have been illustrated and discussed by Hauman, [Veg. Hautes Cord. 125] Anal. Soc. Cien. Argentina 86: 289. t. 21, f. 5 (1918). Chilean specimens and those from Mendoza are rather uniform in appearance and usually have evidently strigose leaflets and fruit. The specimens cited from Neuquen, however, have the ovary and fruit glabrous and two of the collections (Liu Cullin and Pino Hachado) have practically glabrous leaflets. These southern forms have the leaflets of *A. Cruck-*

*shanksii* and seem more closely related to that species than to *A. Amunategui*. I suspect that they may prove to represent a variation worthy of some taxonomic recognition. It will be noted that they come from an altitude distinctly lower than that affected by good *A. Cruckshanksii*.

The fruit of typical *A. Cruckshanksii* is very strongly compressed laterally, the elliptic leathery valves being almost flat and parallel. It is noteworthy, therefore, that in one of the collections from Neuquen (*Parodi 2198*), the valves are not flat but convex and the pod evidently inflated, being lenticular in cross-section and compressed only in a narrow rim about the margin of the valves. The fruit, in fact, is very similar to that found in some specimens (*Carette 242 and 243*) of *A. Amunategui*.

22. *Astragalus Amunategui* Philippi, Anal. Univ. Chile 84: 31 (1893).—Type from Las Choicas.

*Astragalus Amunateguianus* Philippi ex Reiche, Anal. Univ. Chile 97: 560 (1897), and Fl. Chile 2: 103 (1898).—A variant spelling.

*Tragacantha Cruckshanksii* var. *glabrescens* Kuntze, Rev. Gen. 3: 73 (1898).—Type from Chilean side of the Paso de la Cruz Piedra, 2500 m. alt., *Kuntze*.

*Astragalus Moyanoi* Spegazzini, Rev. Fac. Agron. y Vet. La Plata 3: 601 (1897).—Type from Teka-choique, western Chubut, ca. lat. 43° 30', *Moyano*.

RANGE: Southern Mendoza and adjoining Santiago south into Patagonia.

CHILE. Santiago: Paso de la Cruz Piedra, 2500 m. alt., *Kuntze* (type of var. *glabrescens*, NY; isotypes US, BD). Colchagua: "Cord. de San Fernando," ex *Philippi* as *A. Amunateguianus* (US, K, BD).

ARGENTINA. Mendoza: Las Choicas, Jan. 1872, ex *Philippi* as *A. Amunateguianus* (Speg); Cuesta de los Aflijidos, *Ruiz Leal 1877* (G); Cerro de Guanacos, 2600 m. alt., *Carette 242 and 243* (LP); Cerro Nevado, dept. S. Rafael, *Carette 2552* (G). Neuquen: Mangrullo, 900 m. alt., *Ammann 76* (FM); Laguna Llancanelo, Nov. 1902, herb. *Spegazzini 2145* (Speg). Chubut: Rio Teka-choique, 1889, *Moyano* (type of *A. Moyanoi*, Speg); Comodoro Rivadavia, *Renard 13804* (G), *Ferruglio 30/1859* (G), and *Parodi 289* (Parodi); Puerto Madryn, *Dusen 5374* (Stock).

The plants here assembled under *A. Amunategui* come from an area lying between the ranges of *A. patagonicus* and *A. Cruckshanksii* and perhaps intergrade with both species. Their closest relationship seems to be with *A. patagonicus*. Indeed they may prove to be simply a luxuriant northern form of that southern species.

Typical *A. Amunategui* is a plant having the gross habit of *A. Cruckshanksii* but differing in its lanceolate leaflets and somewhat inflated strigose pods. The flowers and fruit are bunched in a subumbellate cluster on peduncles that are distinctly recurved at maturity. Specimens very similar to the type have been collected at Cerro Guanacos and Cerro Nevado, Mendoza, by *Carette*. The other collections referred to the species differ from those distributed by *Philippi* and *Carette* in being more erect plants with elongate loosely flowered racemes on erect peduncles. Included among them are the types of *A. Moyanoi* and *T. Cruckshanksii* var. *glabrescens*. These types are rather similar in general appearance, but differ in some details. The type of *A. Moyanoi* has the ovary and the leaflets glabrous whereas these are strigose and the leaflets less definitely acute in the var. *glabrescens*. The collections from Comodoro Rivadavia and Puerto Madryn much resemble one another and are very slender plants

with very few erect stems and very slender possibly annual roots. The racemes are loosely flowered and elongate and borne on erect peduncles. This particular form is very similar to some of the luxuriant forms of *A. patagonicus*.

When Philippi published *A. Amunategui* he stated that it was named in memory of Michal L. Amunátegu and gave its source as "Habitat in Andium loco Las Choicas dicto." I have seen a number of collections, scattered in various herbaria, distributed by Philippi as "*A. Amunategui-anus* Phil." These are mostly labeled as from the "Cordillera de San Fernando," but one is given as from "Las Choicas, Jan. 1872." All these specimens are extremely similar in details of size, maturity, discoloration etc., and I believe them to be parts of one collection. They agree closely with the original description and almost certainly are duplicates of the type. Their source is probably a short distance east of the Chile-Argentina boundary in Mendoza. There is a well known route from San Fernando, Colchagua, up the Rio Tinguiririca to the Paso de las Damas on the continental divide. Descending eastward from the pass the road crosses Arroyo de Las Choicas and passes close to the Mina de Las Choicas. The type of the *Astragalus* was probably obtained in this vicinity. In Jan. 1872 Paul Ortega traveled this route to Valle Hermosa (about 25 km. south of Choicas) and collected the types of *Gayophytum robustum* Phil., *Verbena ulicina* Phil., *Boopis breviscapa* Phil., *Carex vallis-pulchrae* Phil., etc., and very likely the original material of our plant also.

As now known the species is practically confined to Argentina. The only Chilean material seen is the collection by Kuntze, the type of the var. *glabrescens*, labeled "Chile, Paso Cruz, 2500 m., Jan. 1892." If the data on the label are trustworthy the plant came from 1000 m. below the summit of Paso de la Cruz Piedra in the headwaters of the Rio Maipo, in the province of Santiago. Interestingly, among all the specimens referred to *A. Amunategui*, this Chilean one has characters most closely approaching those found in *A. Cruckshanksii*.

23. *Astragalus patagonicus* (Phil.) Spegazzini, Rev. Fac. Agron. y Vet. La Plata 3: 505 (1897).

*Phaca patagonica* Philippi, Anal. Univ. Chile 84: 20 (1893). — "In Patagonia haud procul a colonia chilensi Decembri 1878 legit orn. Henricus Ibar. . ."

RANGE: Southern Patagonia.

CHILE. Magallanes: Patagonia, ex Philippi as *P. patagonica* (isotype, K, Speg).

ARGENTINA. Santa Cruz: Killik Aike, Rio Gallegos, Brown 27 (NY); Estab. Las Vegas, Rio Coyle, Dauber 129 (G); upper Rio Santa Cruz, Lago Argentino, Hauthal 8786 (Speg); near Lago Argentino, Furlong 82 (G, NY); Rio Santa Cruz, 1882, Spegazzini (Speg); Puerto San Julian, Dusen 6332 (K, Stock) and Blake 2A (K, BM); Caleta Olivia, Donat 141 (G in pt.; K, NY); Cañadon de las Vacas, 1891, Beauvils (G); Patagonia, lat. 50°-53°, Moreno & Tonini 188 and 206 (NY). Chubut: Valle de la Laguna Blanca, Koslowsky 178 and 183 (K); Pampa Chica, Skottsberg 539 (Stock); Lago Musters, 1899, Illin (Speg); Lago Colhue Huapi, 540 m. alt., Riggs 44 (G, FM); Corcovado, 1901, Illin (Speg); along Rio Carren-leofu, 1900, Illin (Speg). Neuquen: Cord. del Viento, subito de Atrenco, Rengonense 295 (G).

This species appears to be most common in Santa Cruz and southern Chubut. The plants are dwarfed with the leaf-bearing seasonal stems only a few centimeters long and with the internodes very much shortened or scarcely developed. A multicapital caudex is formed from which arise tufts of leaves and the scapose peduncles. The flowers are usually few and borne in umbellate clusters. The flattened pod may be strigose, but frequently is more or less glabrous. The leaflets are narrow, 1–3 mm. broad, and linear. Most of the collections cited are readily placed and obviously referable to *A. patagonicus*. A few specimens from Santa Cruz (Furlong 82; Dusen 6332) and Chubut (Lago Musters and Carren-leofu. Illin) are more vigorous plants with more elongate stems than the other specimens cited and make embarrassing approaches to the various forms of *A. Amunategui*.

24. *Astragalus Burkartii*, sp. nov.

Herba caespitosa; ramulis caudicis prostratis congeste breviterque ramosis 3–5 mm. crassis, stipulis laxe ochraceis 3–5 mm. longis glabris vel breviter ciliatis marcescentibus chartaceis pallidis dense vestitis; foliis apice caudicis stipulosis congestis; rhachibus 10–30 (–40) mm. longis; foliolis ellipticis (2–) 3–6-jugatis 2–5 mm. longis 1–3 mm. latis viridibus crassiusculis costatis sed enervatis supra glabris subtus sparsissime adpresseque villosis apice rotundis vel retusis; floribus 2–4 in racemos brevissimos 1–5 mm. longe pedunculatos dispositis; calycibus sparse adpresse villosis 8–10 mm. longis tubo 2–3 mm. crasso 1–2 mm. longe pedicellato dentibus gracilibus 2–5 mm. longis tubo brevioribus; corolla conspicua violacea vexillo 15 mm. longo, lamina late elliptica 8–10 mm. longa ca. 7 mm. lata, alis 3–4 mm. latis vexillo 2 mm. brevioribus carina 2–3 mm. superantibus; ovario glabro; leguminibus evidentibus ascendentibus biconvexis glabris unilocularibus basim versus crassioribus lateraliter compressis margine acutis prominentibus; valvulis 10–15 mm. longis 5–7 mm. latis medium versus vel paulo infra medium latioribus apice acutis recte apiculatis basi obtusis vel rotundis intus sparse pubescentibus; seminibus 10–15 nigrescentibus maculatis compressis ca. 2.5 mm. diametro.

ARGENTINA. Tucuman: Peñas Azules, Sierra Calchaquies, dept. Tañi, among dry rocks, fl. rather large, blue, 3400 m. alt., Jan. 1933, *Burkart* 5403 (G). Catamarca: Cerro de la Tambilla, low and spreading, fl. pinkish blue, March 25, 1917, *Joergensen* 1337 (Gray Herb., type); Sierra del Anconquija, dept. Santa Maria, rocky places, fl. bright violet, 4600 m. alt., March 1, 1925, *Venturi* 6693 (US). Salta: Cerro de Cachi, dept. San Carlos, rocky places, fl. bright violet, 4500 m. alt., March 12, 1927, *Venturi* 6692 (US); between Cuesta del Arca and Trancas, Jan. 1897, *Spegazzini* 2100 and 2102 (Speg); Pampa Grande, Jan. 1897, *Spegazzini* 2103 (Speg).

The nearest relative of *A. Burkartii* is probably *A. Venturii*, a poorly understood and perplexing species also occurring at high altitudes in northwestern Argentina. From that species it is readily separated by having flowers almost twice as large, usually more numerous leaflets, a sparser pale rather than yellowish indument, a more compacted caudex with less elongate stems, and looser pale rather than yellowish sheathing stipules. The fruit of *A. Burkartii* appears to be much larger and its sutures are both salient. They are laterally compressed and ovate-elliptic in outline. No traces of a false septum are present.



25. *Astragalus crypticus*, sp. nov.

Planta humilis caespitosa; caudice multicepitali denso e radice valida profunda oriente, ramulis stipulis ochraceis imbricatis obtectis apice fasciculos foliorum dense argenteo-strigosorum proferentibus; stipulis marcescentibus stramineis vaginatis ca. 5 mm. longis dorse sparse villosis acutis vel apice emarginatis; rhachi folii 1–3.5 mm. longo basi inter stipulis occulto; foliolis lanceolatis vel ellipticis 3–4-jugatis 1–2.5 mm. latis 3–6 mm. longis apice acutis; floribus axillaribus solitariis subsessilibus; calycibus inter stipulis occultis 5–6 mm. longis, tubo strigoso 3–4 mm. longo, lobis angustis 2–3 mm. longis; corolla flavescente, vexillo ca. 6–7 mm. longo cum lamina 3.5–4 mm. lata, alis 5–6 mm. longis angustis quam carina 1.5 mm. longioribus; leguminibus inter stipulis occultis 3–4 mm. longis 1–1.7 mm. crassis 2–3 mm. altis dense appressi-villosis, margine vix intrusis, suturis prominentibus donatis, valvulis cartilagineis ellipticis vel oblique ovatis; seminibus saepe 2.

ARGENTINA. Tucuman: Cumbres Calchaquies, dept. Tafi, en la puna tucumana, 4400 m. alt., Jan. 30, 1933, *Burkart 5407* (type, Gray Herb.); La Puerta, Sierra Calchaquies, 4000 m. alt., Jan. 30, 1933, *Burkart 5405* (G); Sierra del Cajon, dept. Tafi, mountain slopes among rocks, fl. yellowish, 3500 m. alt., March 12, 1927, *Venturi 9435* (US).

A very distinct species with its closest relations in *A. cryptobotrys* of northwestern Argentina and adjacent Chile. The two species agree in fruit-structure. Their pods are more or less lenticular with both sutures salient. The valves are cartilaginous and abundantly covered with similar appressed silky hairs. There is no false septum developed. The two species differ, however, in size of fruit, habit of growth, and shape of leaflets. In gross habit our present plant much simulates that of *A. peruvianus* and its allies.

26. *Astragalus cryptobotrys*, nom. nov.

*Phaca clandestina* Philippi, Fl. Atac. 14 (1860).—Type from Valle Sandon, 2700 m. alt., *Philippi*.

*Astragalus clandestinus* (Phil.) Hieronymus, Bol. Acad. Nat. Cien. Cordoba 4: [Sert. Sanjuan.] 22 (1881); Reiche, Anal. Univ. Chile 97: 537 (1897), and Fl. Chile 2: 80 (1898); not Roth ex Sprengel (1826).

*Phaca cryptantha* Philippi, Fl. Itin. Tarapaca. 14 (1891).—Type from between Aguas Calientes and Socaire (prov. Antofagasta, east of Salar de Atacama), 3000 m. alt., *Philippi*.—Not *Astragalus cryptanthus* Wedd. (1861).

?*Astragalus clandestinus* var. *Flossdorfii* Hicken, Darwiniana 1: 28 (1922).—Type from Queb. de Encrucijada, Sierra Famatina, La Rioja, 4000 m. alt., March 1913, *Flossdorf*.

RANGE: In Chile known only from the puna in eastern Antofagasta. In Argentina ranging at high altitudes from Salta (and Los Andes) south to Tucuman and San Juan.

CHILE. Antofagasta: Atacama Desert (betw. Ag. Calientes and Socaire?), Jan. 1885, ex *Philippi* as *P. cryptantha* (BD); Aguada Veras, 4000 m. alt., *Werdermann 1034* (G, K, US, BD); Cord. Domeyko, 1925, *Berninger 487* (BD); Atacama Desert (Valle Sandon?) *Philippi* as *P. clandestina* (K, DB, Boiss); Guanaqueros to Agua Delgada, Feb. 5, 1901, *Reiche* as *A. bolivianus* (G, BM).

ARGENTINA. Salta: Cerro de Cachi, 4000–4500 m. alt., 1927, *Venturi 6703* (US). Catamarca: Cerro Yutuyaco, north of Andalgalá, 3500 m. alt., *Joergensen 1627* in pt. (US); Sierra Anconquija, 4600 m. alt., 1924, *Venturi 6624* (US); Junta de los Reales Blancos, 1930, *Castillanos 30498* (G). Tucuman: Las Lagunas, dept. Tafi, 4400 m. alt., 1933, *Parodi 10829* (G); Cumbres Calchaquies, dept. Tafi, 4000–4400

m. alt., 1933, *Burkart* 5399, 5400 and 5401 (G); Est. Santa Rosa, dept. Chicligasta, 4600 m. alt., 1925, *Venturi* 4008 (US); Est. Las Pavas, dept. Chicligasta, 3500 m. alt., 1926, *Venturi* 4711 (US); El Pelado, 1912, *Rodriguez* 450 (G). La Rioja (Sierra Famatina): Alto Blanco, 1928, *Castillanos* 28/188 (G); Mina Jareta, 1879, *Hieronymus & Niederlein* 806 (K, BD); between Mina Jareta and Alto de Espiritu Santo, 1879, *Hieronymus & Niederlein* 795 (BD); Cueva de Perez, 1879, *Hieronymus & Niederlein* 358 (BD); Tocino Pass, 4320 m. alt., 1915, *Hosseus* 1911 (BD); below Tocino Pass, 3900-4320 m. alt., 1915, *Hosseus* 1903 (BD). San Juan: Paramillo, southwest of San Juan, Jan. 1876, *Echegaray* (BD); Cord. Colangüil, Queb. del Salto, 1930, *Perez-Moreau* 30/104 (G).

A plant much resembling *A. geminiflorus* of Ecuador in gross habit. That northern plant, however, has an incompletely 2-celled fruit with the lower suture inflexed, smaller more crowded distinctly silvery silky leaflets, short petioles, and a somewhat more trailing habit of growth. I do not believe that there is any close relationship between *A. geminiflorus* and *A. cryptobotrys*. The latter, in any case, has its closest relations in *A. crypticus* and *A. Asplundii*. Reiche has cited *Phaca diminutiva* Phil., which was collected with the type of *P. cryptantha* Phil., as a synonym of the present species. The plants described as *A. diminutiva*, however, seem so very much smaller than the most reduced forms of the present species known to me that I hesitate to accept it as a synonym. In any case the name cannot be transferred to *Astragalus* since the resulting binomial is preoccupied by another valid species.

27. *Astragalus Asplundii*, sp. nov.

Herba perennis incana; caulibus numerosis e caudice humili laxo ramoso orientibus 5-10 cm. longis simplicibus tomentosis, internodiis 3-20 mm. longis; rhachi folii 4-8 mm. longo; foliolis 5-8-jugis lanceolatis vel lanceolato-ovatis 3-10 mm. longis. 2-4 mm. latis basim versus latioribus apicem versus gradatim attenuatis concoloribus planis utrinque villosa-tomentosis; stipulis laxo ochraceis grandis chartaceis 4-6 mm. longis; pedunculis axillaribus 5-15 mm. longis quam foliis conspicue brevioribus laxo ascendentibus ad apicem flores 3-7 capitato-congestos productis; calycibus subsessilibus ca. 5 mm. longis, lobis subulatis ca. 2 mm. longis; corolla ca. 14 mm. longa; leguminibus sublenticularibus dense villosa-strigosis unilobularibus 6-7 mm. longis 5-6 mm. altis 3-4 mm. crassis sub medium crassioribus et altioribus basi oblique rotundis apice obtusis margine angulatis vix inflexis.

BOLIVIA: Uyuni, Potosi, 3700 m. alt., March 24, 1921, *Asplund* 6132 (type, U. S. Nat. Herb.) and 3093 (Upsala); Uyuni, 3700 m. alt., March 25, 1921, *Asplund* 6131 (US) and 3161 (Upsala); Uyuni, 3660 m. alt., Feb. 23, 1903, *Hicken* 12 (Stock).

A very distinct species with evident relations in *A. cryptobotrys*. From the latter it differs in its larger more elongate acute leaflets and its clustered flowers borne on obvious axillary peduncles. The species is known only from one locality in southern Bolivia, lying several hundred kilometers to the north of the range of its relative.

28. *Astragalus bellus* (Kuntze) Fries, Nova Acta R. Soc. Sci. Upsala IV, 11: 135 (1905).

*Phaca pulchella* Clos in Gay, Fl. Chile 2: 92 (1846); Weddell, Chlor. Andina 2: 263 (1861).—Type from Cordillera de los Patos, Gay 490.

*Astragalus pulchellus* (Clos) Reiche, Anal. Univ. Chile 97: 539 (1897), and Fl. Chile 2: 82 (1898). Not Salisb. (1796), nor Boiss. (1843).

*Tragacantha bella* Kuntze, Rev. Gen. 2: 940 (1891). Based upon *P. pulchella* Clos.

RANGE: Known only near the Chile-Argentine boundary, between the provinces of Coquimbo and San Juan.

CHILE-ARGENTINE BOUNDARY: Cordillera de los Patos, rare about the base of scattered rocks, 3100 m. alt., *Gay* 490 (type, Paris); Chile, *Gay* (G, K, BD).

A small depressed plant with silky strigose stems and leaves. The strigose fruit is several-seeded, compressed about the margins, and nearly as broad as long. The peduncles are 1–3 mm. long and bear loose clusters of several flowers. The pedicels are about 1 mm. long. The species seems to be most closely related to *A. cryptobotrys* but has much more slender stems, smaller stipules, and less compressed legumes which are compressed about the margins.

29. *Astragalus tehuelches* Spegazzini, Anal. Mus. Nac. Buenos Aires 7: 268 (1902). — Type from Rio Chico, Chubut, *Ameghino*.

RANGE: Known only from southern Patagonia (Chubut).

ARGENTINA. Chubut: Rio Chico, 1900, *Ameghino* (type, Speg.); Chubut, Dec. 1900, collector not given (Speg.).

A very distinct species and one very readily recognizable by its coarse, rather fleshy, conspicuously emarginate leaflets and its elongate fruit 2.5–3 cm. long. The pod is narrowed at both ends and is somewhat falcate, the lower margin being concave and the upper one convex in lateral outline. The lower suture is strongly inflexed. There is a very narrow incomplete hyaline false septum. The corollas of the species have not been seen. The coarse calyx, however, suggests that the corollas are probably 10–15 mm. long. The species may have its closest relative in the very different *A. Ruiz-Lealii* of Mendoza.

30. *Astragalus chubutensis* Spegazzini, Anal. Mus. Nac. Buenos Aires 7: 266 (1907). — Based upon collections made by Illin on the Rio Chubut (near Lago Musters) and Rio Carren-leofu.

RANGE: Known only from Chubut and northern Santa Cruz, Patagonia.

ARGENTINA. Chubut: Rio Chubut near Lago Musters, "campo alto cerca del primer manantial," 1899, *Illin* (type, Speg.); Carren-leofu, 1900, *Illin* (Speg.). Santa Cruz: Caleta Oliva, 325 m. alt., Oct. 23, 1929, *Donat* 178 (G, NY); Minerales, 300 m. alt., Oct. 23, 1929, *Donat* 178 (K, FM, Stock); Lago Argentino, upper Rio Santa Cruz, Jan. 1902, *Hauthal* (Speg.).

A low subcaespitose plant with the numerous leaf-bearing shoots 1–2 cm. long. The leaves, stems, peduncles and calyces are densely appressed villous. This indument is white except on the calyces and stipular sheathes where black hairs may be numerous. The peduncles are 3–5 cm. long and evidently surpass the numerous more or less basal leaves. They are terminated by a capitate cluster of 3–8 blue flowers which become reflexed after anthesis. No mature fruit has been seen. Hauthal's collection, however, has immature fruits which suggest that when mature they would be about 1 cm. long, straight, and only incompletely exerted from the calyx.

31. *Astragalus distinens* Macloskie, Fl. Patagonia 2: 505 (1905).—A renaming of *A. distans* Gray, not Fischer.  
*Astragalus distans* Gray, Bot. U. S. Explor. Exped. 1: 412 (1854). Not Fischer (1853).—Type collected by Pickering on the dunes at the mouth of the Rio Negro, northern Patagonia.

RANGE: From the Rio de la Plata westward and northwestward to San Luis and Jujuy, and southward, probably in the interior, to the lower Rio Negro.

ARGENTINA. Rio Negro: dunes near mouth of Rio Negro, *U. S. Explor. Exped.* (type, US, G). Buenos Aires: Barrancas del Cazador near Escobar, Nov. 23, 1924, *Doello-Jurado* 24/1891 (G); Campana, limy barrancas along the Rio Parana, fl. bluish, *Parodi* 4736 (Parodi) and 8609 (G); *Burkart* 3080 and 5661 (G); *Hauman* 13807 (G); *Castellanos* 26/1912 (G). Santa Fe: Arroyo Frias, south of Rosario, fl. blue, Oct. 1929, *Cabrera* 931 (Stock, G). Corrientes: without locality, 1821, *Bonpland* (Paris). Cordoba: Achiras, fl. bluish white, 800 m. alt., 1930, *King* 735 (BM); Capilla por Los Cocos, Nov. 1915, *Hauman* 13789 (G). San Luis: Cerro del Portezuelo, Nov. 1820, *Gillies* (K); San Luis, Jan. 1910, *Spegazzini* (Speg); La Guardia, March 23, 1882, *Galanter* (BD). La Rioja: near Los Corrales, Sierra Famatina, 1879, *Hieronymus & Niederlein* (BD). Catamarca: Sierra del Anconquija, dept. Santa Maria, fl. yellowish, in rocky places, 4200 m. alt., Jan. 1926, *Venturi* 6628 (US); [?] Los Hoyitos, Feb. 7, 1930, *Castellanos* 30/491 (G). Tucuman: betw. Amaicha and El Molle, dept. Tafi, dry place, fl. dark blue, Feb. 3, 1933, *Burkart* 5393 (G); between Amaicha and El Molle, 2400 m. alt., fl. pale blue, Feb., 1933, *Burkart* 5391 (G); Amaicha del Valle, dept. Tafi, 2300 m. alt., dry rocky valley, fl. violaceous white, Jan. 31, 1933, *Burkart* 5392 (G). Jujuy: Tilcara, "en los pajonales del cerro," fl. white, 3000 m. alt., Feb. 19, 1927, *Venturi* 7422 (US); Cerro La Solidar, dept. Humahuaca, "en los pastigales," fl. bright blue, 3000 m. alt., Jan. 23, 1929, *Venturi* 8894 (G, US).

URUGUAY. Carasco, Montevideo, Dec. 1869, *Fruchard* (Paris); Montevideo, sandy place, *Gibert* 391 (K); Banados de Santiago Vazquez, 1937, *Rosengurt* 554 (G); Arenal Grande, April 1876, *Arechavaleta* (BD); on face of very dry clay banks at Cape Fray Bentos, Rio Uruguay, *Tweedie* (K); Fray Bentos, 1933, *Herter* 1833 (G).

The plant here treated is a very distinct one which is quickly recognizable by its unique fruit. It is most closely related to the more southerly ranging, coastal *A. Bergii* with which it agrees very closely in all structures save its fruit. The type of *A. distinens* is given by Gray, l.c., as from the "Rio Negro, North Patagonia; on sand-hills" where it is said to have been collected with *A. Bergii* (= *A. distans* var.  $\beta$  Gray, l.c.). Pickering, Geogr. Distr. Animals and Plants 77 (1870), who was one of the collectors, indicates that *Astragalus* was collected on the "tract of sand-hillocks" at the mouth of the Rio Negro and presumably those to the southward of the anchorage at the river mouth. Except for the type, I have seen no material of *A. distinens* labeled as coming from south of northernmost Buenos Aires and northern San Luis. Hauman, Anal. Mus. Nac. Buenos Aires 24: 396 (1913), and Manganaro, Anal. Soc. Cien. Argentina 87: 149 (1919), however, report "*A. Bergii*" in western parts of the province of Buenos Aires (Nuevo Plata, and Rivera) towards the La Pampa boundary. There is a possibility that these records may refer to material of *A. distinens* and so indicate an extension of that species from San Luis and Cordoba southward in the interior towards the lower Rio Negro.

It is difficult to believe that the types of two such closely related species as *A. distinens* and *A. Bergii* could have both come from the mouth of the



Rio Negro. The species concerned are so closely allied that hybridization could be expected if they grew in the same area. The type of *A. distinens* is thoroughly typical of the species as here accepted and is said to have been collected with plants that are equally typical of *A. Bergii*. It was collected by members of the U.S. Exploring Expeditions, under Capt. Wilkes, while the ships anchored at the mouth of the Rio Negro during the final week of Jan. 1839. No other landing was made by the expedition between Rio de Janeiro and the Straits of Magellan. The material of *A. Bergii*, collected by the expedition, probably did come from near the anchorage, since that species has been found there subsequently by various botanists. The material of *A. distinens*, however, was probably collected further north, possibly during some overland excursion made while the ships were at anchor. The material collected of the two species is very mature and has ripened pods. That of *A. distinens* is slightly less matured and not so dried and weathered as that of *A. Bergii*.

32. *Astragalus Bergii* Hieronymus, [Sert. Patagon. 17] Bol. Acad. Nac. Cordoba 3: 343 (1880).—Type from near mouth of the Rio Negro, *Berg* 79.

*Astragalus distans* var.  $\beta$  Gray, Bot. U. S. Explor. Exped. 1: 412 (1854).—Type from near mouth of the Rio Negro.

RANGE: Known only from the southern parts of the province of Buenos Aires where it seems to be confined to sands near the coast.

ARGENTINA. Buenos Aires: mouth of the Rio Negro, Oct. 2, 1874, *Berg* 79 (type of *A. Bergii*, BD); near mouth of the Rio Negro, *U. S. Explor. Exped.* (type, US, G); El Carbon, Carmen de Patagones, Feb. 1898, *Spegazzini* (Speg); Bahia Blanca por San Blas, 1903, *Ameghino* 13806 (G); Baterias, Bahia Blanca, Dec. 1901, *Spegazzini* (Speg); Monte Hermoso, 1916, *Carette* (G); Sierra de la Ventana, Nov. 1904, *Dusen* 6272 (Stock); Sierra de Curamalal, Arroyo Cochenleufú, fl. blue, Nov. 1939, *Cabrera* 5490 (G).

The plant treated here has been confused with that which I have called *A. distinens*. The notes by Spegazzini, Anal. Soc. Cien. Argent. 47: 233 (1899), and by Hauman, Anal. Mus. Nac. Buenos Aires 24: 396 (1913), apply to both species. Manganaro, Anal. Soc. Cien. Argent. 87: 149, fig. 15 (1919), however, while giving a general range that includes *A. distinens*, seems to have figured and described plants referable to *A. Bergii* as here accepted. She states, however, that she examined specimens from Rio Negro, Bahia Blanca, Sierra Ventata and Nueva Plata. I have seen no material from as far north as Nueva Plata (Partido Pehuajo, prov. Buenos Aires). Monticelli, Lilloa 3: 345, fig. 22 (1938), reporting *A. Bergii* from La Pampa, illustrates a plant which seems to represent that species. A specimen from him, collected at Telén, La Pampa, showing flowers but no fruit, bears the annotation "fragmento del ilustrado en mi trabajo." The acceptance of this record would extend the known range of *A. Bergii* from southwestern Buenos Aires northwestward into La Pampa.

The type of *A. Bergii*, which I examined at Berlin, is labeled as collected from the shade of shrubs of the Patagonian campo near the Rio Negro on Oct. 2, 1874. According to Berg, *Peterm. Geogr. Mittheilungen* 21: 367 (1875), he was on the brig "Rosales" which sailed down the Rio Negro from Carmen de Patagones on Sept. 29, 1874. After a halt of three days

at the mouth of the Rio Negro the vessel arrived at the Rio Santa Cruz on Oct. 8th. On Oct. 2nd, the date on which the type was collected, Berg accordingly must have been at the mouth of the Rio Negro.

I am unable to distinguish flowering, non-fruiting plants of the two species I am calling *A. distinens* and *A. Bergii*. Since Berg's type is at anthesis, and entirely lacks fruit, I have arbitrarily associated the name "*A. Bergii*" with what appears to be the common species about the mouth of the Rio Negro. This application of the name, however, must remain a practical expedient, designed to avoid the coining of a new botanical name, until more collecting is done about the lower Rio Negro or until someone discovers floral or vegetative characters whereby the type of *A. Bergii* can be positively assigned to one or the other of the two species concerned here, for, as noted in my discussion of *A. distinens*, the type of this latter species also came from the mouth of the Rio Negro and possibly may represent the species collected by Berg.

33. *Astragalus Spegazzinii*, nom. nov.

*Astragalus Rengifo* var. *lejocarpa* Spegazzini, Anal. Mus. Nac. Buenos Aires 7: 268 (1902). — Type from near the confluence of the Rio Limay and Rio Neuquen, Spegazzini.

RANGE: Known only from the upper parts of the watershed of the Rio Negro.

ARGENTINA. Rio Negro: near the confluence of the Rio Limay and Rio Neuquen in dry sandy places, Dec. 1897, *Spegazzini* (type, Speg); near General Roca, valley of the Rio Negro, in clay soil, 1915, *Fischer* 145 (G, NY, US, K).

In the flowering condition this plant very much suggests some of the intermediates connecting *A. Amunategui* and *A. patagonicus*. Fischer's plant has been reported as *A. Cruckshanksii* by Hicken, *Physis* 2: 15 (1915). Spegazzini reported his collection first, Anal. Soc. Cien. Argent. 47: 237 (1899), as *A. Arnottianus* and later, as his proposed new variety, *A. Rengifo* var. *lejocarpa*. The relations of the species are certainly not with *A. Cruckshanksii* and its allies, nor with *A. Arnottianus*. The fruit is linear, has an inflexed lower suture, and becomes deflexed in age. *Astragalus carinatus* is probably its closest relative. Fischer's plants, collected at anthesis, lack even partially matured fruit. Spegazzini's collection has young fruit. The largest of these are falcate and linear, becoming 2 cm. long, ca. 1.7 mm. high and strongly flattened laterally. The upper edge is concave and the lower is convex in lateral outline.

34. *Astragalus carinatus* (H. & A.) Reiche, Anal. Univ. Chile 97: 557 (May, 1897), and Fl. Chile 2: 100 (1898); Kurtz, Bol. Acad. Nac. Cordoba 15: 511 (July 1897).

*Phaca carinata* Hooker & Arnott, Bot. Misc. 3: 185 (1832). — Type from below Hornillos, Mendoza, *Cruckshank* 89.

*Phaca carinata* var.  $\beta$  Hooker & Arnott, Bot. Misc. 3: 185 (1832).

*Phaca andicola* Gillies ex Hooker & Arnott, Bot. Misc. 3: 185 (1832), in synonymy.

RANGE: Base of the cordilleras of Mendoza; Cordoba; and perhaps Catamarca.

ARGENTINA. Mendoza: below the Hornillos, *Cruckshank* 89 (type, Kew); Portez. del Pantanillo and Portez. de la Casa de Piedra, *Gillies* (type of var.  $\beta$ , K); abundant along the descent from Portez. de la Casa de Piedra, *Gillies* (K); Rodeo de los Chacayos, Nov. 3, 1834, *Gillies* (K); near baths of Villa Vicencio, Nov. 15, 1822,



*Gillies* (K); hills above baths of Villa Vicencio, Nov. 15, *Gillies* (G); Potrerillos, Est. "El Salto," fl. blue, 1900 m. alt., Nov. 1933, *Ragonese* 97 (G); Mendoza, Jan. 1910, *Spegazzini* (Speg.); El Alambre Atravezado, Estan. La Vila, Tupungato, *Ruiz Leal* 2799 (G); Puesto del Manzano, Tunuyan, 1700-2700 m. alt., *Ruiz Leal* 1745 and 2318 (G); Cerro Nevado, dept. San Rafael, *Carette* 2555 (G). Cordoba: Capital, *herb. Burkart* 2140 (Burkart).

In gross habit this plant frequently suggests forms of the very different *A. Arnottianus*, but may be readily separated by its fruit and by its leaflets which are glabrous on the upper surface. It is a plant of the base of the cordilleras, and not of their higher parts. The fruit is glabrous, deltoid in cross-section, and has its lower surfaces broadly inflexed and flattened. The corolla varies in size from 9-12 mm. in length. The type represents the large-flowered form.

Perhaps referable to *A. carinatus* are some collections from Catamarca (Yacutula, *Schickendantz* 61; Granadillas, *Schickendantz* 98 and 104; Catamarca, *Lorentz* 41) which have a form of corolla slightly different from that in typical plants of Mendoza and Cordoba. Also questionably referred to the present species is a collection made by Perez Moreau (no. 30/97) near Las Vicunitas, Queb. de Conconta, in the cordilleras of San Juan. This latter is a caespitose plant with minute leaflets, about 1 mm. long, and reduced scapes only 5-15 mm. high. It may be a compacted depauperate montane form, comparable to depauperate compacted phases of *A. Arnottianus* that have been collected near El Portillo, Mendoza.

### 35. *Astragalus Parodii*, sp. nov.

Herba perennis e radice crassa valida profunda oriens; caulibus 3-20 (saepe 5-15) cm. longis foliosis angulatis numerosis gracillimis ca. 1 mm. crassis decumbentibus longe sparseque ramosis sparse brevissimeque strigosis e caudice ramoso 5-10 cm. diametro subterraneo erumpentibus internodiis 3-6 cm. longis; stipulis vix conspicuis 1.5-3 mm. longis infra medium connatis inconspicue strigosis chartaceis, lobis herbaceis saepe reflexis; rhachibus foliorum 1-2.5 cm. longis; foliolis 3-6 jugis medio-plicatis oblongo-obovatis vel anguste oblongis 3-10 mm. longis 1-2.5 mm. latis costatis sed enervatis subtus sparse inconspicueque strigosis, supra saepe glabris, apice retusis, infra medium basim versus contractis; racemis 4-7 floris 1-2 cm. longis laxifloris; pedunculis 1-4 cm. longis foliis 1-2-plo longioribus; calycibus 3-4 mm. longis sparse et pallide nigreque strigosis, lobis linearibus quam tubo paulo brevioribus; corolla caerulea; vexillo 8-10 mm. longo, lamina obovata 5-6 mm. lata 5-7 mm. longa apice emarginata; alis 7-8 mm. longis quam carina 1-2 mm. longioribus; leguminibus subovoideis vel oblongis lateraliter compressis angulatis unilobularibus 5-9 mm. longis 2-3 mm. crassis 2-3.5 mm. altis induratis tarde dehiscentibus pendulis, apice acutis et apiculatis, basi rotundis, infra medium vel basim versus crassioribus et latioribus, dorso acutis et summam ad marginem incrassatis et paulo compressis, subtus planis vel leviter subintrusis; suturis prominentibus; seminibus congestis ca. 10.

RANGE: Known only from the Sierra de Achala, Cordoba. All collections seem to be from the Dept. Punillo near Los Gigantes.

ARGENTINA. Cordoba: base of Los Gigantes, Dec. 2, 1878, *Hieronymus* (BD); Quebrada at base of Los Gigantes, Jan. 22, 1880, *Galander* (BD); near

RANGE: Known only from Mendoza.

ARGENTINA. Mendoza: Mendoza, Jan. 1910, *Spegazzini* (Speg); dry rocky places near Mina La Atala, dept. Las Heras, Nov. 1, 1936, *Ruiz Leal* 4200 (G); bed of Rio Papagayos near Queb. de la Mina La Atala, Oct. 24, 1937, *Ruiz Leal* 3343 (type, Gray Herb.); near Queb. de la Mina La Atala, Sept. 20, 1937, *Ruiz Leal* 4676 (G); Km. no. 59, Paso de la Cumbre, dept. Lavalle, Sept. 20, 1938, *Ruiz Leal* 5297 (G).

A very distinct species characterized by its very slender stems, its annual root, few flowers, and elongate extrorsely falcate pods. In having extrorsely falcate pods which become deflexed, the species can be compared only with the very different *A. tehuelches* of southern Patagonia. The seminiferous (superior) suture of the fruit is strongly convex in lateral outline and not concave nor straight as is prevalent in this genus. The valves are laterally compressed just below the superior suture and then somewhat swollen. The lower suture is abruptly and distinctly inflexed. There is a very narrow hyaline incomplete false septum inside the pod. The species is probably most closely related to *A. tehuelches* and *A. pauranthus*, but has smaller and fewer flowers, more slender stems, and a distinctly annual root. The collection by Spegazzini, cited above, was mixed with material of *A. carinatus* and is part of collection no. 2146 in his herbarium at La Plata.

TO BE CONTINUED

ARNOLD ARBORETUM,  
HARVARD UNIVERSITY.